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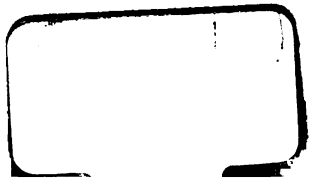

THE

SURGEON'S VADE MECUM.

THE

SURGEON'S VADE MECUM,

A HANDBOOK

OF THE

PRINCIPLES AND PRACTICE OF SURGERY.

Illustrated with numerous Wood Engravings.

BY ROBERT DRUITT,

M. R. C. S.

"Id potissimum agens, ut omissis hypothesibus, in praxi nihil adstruat quod multiplici experientia non sit roboratum."

ACT. ERUD. LIPS. 1722.

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TO

CHARLES MAYO, ESQ.

SURGEON TO THE COUNTY HOSPITAL AT WINCHESTER,

IN GRATEFUL ACKNOWLEDGMENT OF EARLY KINDNESS,

THIS WORK

IS DEDICATED BY HIS AFFECTIONATE NEPHEW

AND OBEDIENT SERVANT,

ROBERT DRUITT.

6, *Bruton Street, Berkeley Square,*
January 1*st*, 1839.

ADVERTISEMENT.

THE following pages are intended to present a familiar account of the Nature and Treatment of the various diseases and injuries that are commonly assigned to the Surgeon's care.

The Author's principal aim in their composition has been a clear, concise, and orderly statement of facts. The purport and limits of the work have prevented him from entering on theoretical details, except when necessary to elucidate the leading principles of surgical pathology, or when treating of subjects that are more than ordinarily obscure or interesting.

Many of the Wood Engravings contained in this volume are doubtless already familiar to the reader. One showing the distinction between the direct and oblique inguinal herniæ is copied from Tiedemann—six are copied from Sir A. Cooper's Treatise on Fractures and Dislocations; the remainder from Mr. Liston's work on Practical Surgery. And the Author begs to record his most grateful acknowledgments to Mr. Liston, who, with a degree of liberality not often to be met with, permitted him to make use of the very same blocks which were engraved under his own directions for the illustration of that admirable work.

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PART I.

OF THE CONSTITUTIONAL EFFECTS OF LOCAL INJURY AND DISEASE.

CHAPTER I.

OF PROSTRATION OR COLLAPSE.

DEFINITION.—Prostration, or collapse, (in the sense in which those terms will be used in the present chapter,) signifies a state of general depression of the powers and actions of life, induced suddenly by any kind of severe injury.

SYMPTOMS.—Shivering; coldness of the surface, especially of the extremities; rapid, feeble, and tumultuous action of the heart and arteries, hurried and sighing respiration; dilated pupil, and oppression of the mental faculties. Sometimes the depression of the vascular system predominates, the patient being in a state of perfect syncope, with the pulse and respiration imperceptible. Sometimes the nervous system is chiefly affected, the patient being bewildered and incoherent as though intoxicated; or even comatose, as though he had taken a narcotic poison. Sometimes there are deadly nausea, vomiting, hiccup, and suppression of urine; and in children, convulsions are extremely frequent.*

TERMINATIONS.—This state may terminate, (1,) (if reaction be healthy and moderate,) in complete *recovery;* and this is most frequently the case when it arises merely from concussion, without organic lesion. Thus a blow on the abdomen may cause extreme collapse, as though some vital organ, such as the stomach or liver, had been severely injured;—and a slight blow on the testicle will often produce considerable faintness, but in both these cases the patient may speedily recover without any further ill consequences. (2.) If reaction be excessive, this state may be gradually succeeded

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* Travers; First Inquiry concerning Constitutional Irritation.

by *fever*, symptomatic of the inflammation to which the local injury has given origin. 3. If reaction be imperfectly developed, it will be converted into the state of *prostration with excitement*, of which we shall speak in the next chapter. 4. If reaction be altogether wanting, the collapse will terminate in *death*. And death may occur immediately on the receipt of the injury, if it be of extreme severity; or otherwise the patient may die more slowly, the pulse at the wrist becoming fainter, and finally ceasing;—the respiration more and more slow and oppressed, till life is gradually extinguished.

CAUSES.—These symptoms may be caused by every variety of injury to which the body is liable. Great and sudden extremes of grief, or joy, or fear, or cold;—large doses of any active poison, such as arsenic, or sulphuric acid, or tobacco;—the sudden impression of miasmata, or of morbid poisons, as the plague;—great loss of blood—and mechanical injuries. The injuries which are most likely to be followed by fatal collapse, are, 1, those of organs that are necessary to life, as the stomach and brain; and it is well known that a severe concussion of either of these organs may extinguish life instantaneously. 2. Injuries of organs which do not easily admit of reparation; as the joints. 3. Injuries that are severe in their nature; as punctured, lacerated, contused, and especially gunshot wounds. 4. Injuries, of great extent, although they may be trivial in degree;—as extensive burns. 5. Injuries occurring to constitutions that are enfeebled by infancy, or old age, by excess* and intemperance,† or by long standing bodily disease or mental depression. Thus the slightest injury or operation may prove fatal to a person labouring under chronic organic disease, such as tubercles in the liver or lungs, although its existence may never have been suspected; and in any case, a firm persuasion that recovery is impossible, is almost sufficient to render it so.

TREATMENT.—The indication is, to excite the vital organs to a moderate and healthy reaction. This is to be fulfilled by the use of diffusive stimulants, such as hot brandy and water, æther, and ammonia; whilst heated bricks or bottles of hot water should be put in the axilla, and between the thighs, and the patient should be warmly covered till the circulation is restored, and the pulse

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* ———— "Tibi quidnam accedet ad istam
Quam puer et validus præsumis mollitiem, seu
Dura valetudo inciderit, seu tarda senectus?"
Hor. Sat. ii. 2, 86.

† Those who always live above par, says Hunter, are extremely liable to sink when attacked by disease or injury; for as they are habitually at the full stretch of living, their powers cannot be excited further to meet any casual emergency.—On the Blood, chap. ii. sect. 1.

has acquired permanent strength and firmness. *Vomiting* may be allayed by the application of very hot water, or of a mustard poultice to the epigastrium;—or by a large dose of calomel and opium;—or by an opiate enema if the bowels are relaxed, or an aperient enema, especially of turpentine, if they are confined.—*Hiccup* is best relieved by a teaspoonful of sp. ætheris comp.—*Convulsions*, *delirium*, and *coma*, are to be treated according to the state of the circulation; by stimulants whilst it is depressed, but by a very cautious bleeding, or leeching, or purging, or application of cold to the head, if they remain after the circulation is restored and the pulse has become firm.—One remedy that it might be well worth while to try in an extreme case, is the wrapping a patient in the skin of a sheep or of any other animal, stripped off immediately after its death. Baron Larrey had seen this done by certain humane Esquimaux, with the greatest benefit, to some shipwrecked Frenchmen that were half dead with cold, fatigue, and hunger; and he put it in practice with equal success in the case of Marshal Lannes, Duc de Montebello, when he was dangerously bruised by a fall from his horse during one of Napoleon's Spanish campaigns.

Cautions.—Care must be taken on the one hand to continue the use of stimulants long enough; and to desist from them gradually, if there be any fear of returning collapse; and, on the other, not to carry them too far—for if the action of the heart be too much excited beyond its powers, it will be more liable to be permanently exhausted. Besides, if the patient be over-stimulated, the succeeding fever and inflammation from the injury will be aggravated; and the danger of hæmorrhage will be increased from any blood-vessels that may have been ruptured. Finally, the vulgar and mischievous habit of bleeding patients immediately after an injury, before they have recovered from a state of faintness and depression, needs only to be mentioned to be condemned.

CHAPTER II.

OF PROSTRATION WITH EXCITEMENT.

Definition.—"Prostration with excitement, and excessive reaction," is the term used by Mr. Travers to signify a state which sometimes follows the collapse from a severe injury; in which there is a violent but transient excitement of the nervous and vascular systems, without the developement of that more permanent and sthenic action which constitutes inflammatory fever.

SYMPTOMS.—The symptoms vary extremely in different cases, although they present the uniform character of extreme and exhausting excitement, without genuine febrile action. There is great anxiety about the region of the heart: the respiration is oppressed and sighing; the pulse exceedingly rapid and bounding, but soft and compressible; the face is flushed, and there is vomiting. But in the majority of these cases the principal feature is the excitement of the nervous system, which is manifested by a peculiar delirium (*delirium traumaticum*) precisely similar to the *delirium tremens*.* The tongue is moist and tremulous; there is a general tremor of the muscles; the patient is totally sleepless, irritable in his temper, answers questions in a snappish, or peevish, or incoherent manner; is often anxious to call himself perfectly well; and as the malady increases, he becomes restless, impatient, and talkative; wishes, perhaps, to get out of bed, and attempts to injure his attendants, and soon becomes most furiously maniacal. In some cases, however, the delirium is of a milder cast; the patient is haunted with extravagant ideas and spectral illusions; or fancies himself busied in his ordinary avocations, and talks perpetually about them.

TERMINATIONS.—The *prognosis* will be the more unfavourable, in proportion as the excitement is violent, as it cannot fail to lead to exhaustion; the pulse becoming irregular, the aspect livid and haggard, the extremities cold, and coma supervening, which is soon followed by death. There will be some hope, however, if the pulse becomes more tranquil and firm, and especially if the patient sleeps.

CAUSES.—The exciting causes of this state are (surgically considered) the various mechanical injuries before enumerated;—acting on constitutions that are weak and consequently irritable;† that have "an increased disposition to act, without the power to act with." Some examples of it occur in children, especially after burns; but they are most frequently met with in the case of persons of middle age and plethoric habit, who habitually indulge in excess of food and spirituous liquors, and to whom it is notorious that many injuries and accidents prove fatal which more temperate persons might have recovered from without difficulty.

TREATMENT.—The indications are to moderate the excitement, and support the strength. If there be violent delirium, with heat and dryness of skin, and the pulse very sharp, the scalp should be shaved and kept wet with evaporating lotions; the bowels should be evacuated with a dose of calomel combined with camphor, followed by an aperient draught, or by enemata if there be much vomiting; taking care, however, not to purge so freely as to reduce the strength. At the same time hyoscyamus should be given

* Copland, Dict. Art. Delirium with Tremor.

† Omne infirmum, naturâ querulum.

in moderate doses every hour or two; such as gr. v. of the extract or ♏ xxx. of the tincture—and if these means fail, one large dose (gr. ii.—iii.) of solid opium, or ♏ xl.—lx. of Battley's solution, may be given after the bowels are opened. If, however, there be greater debility and restlessness, opium may be given in small doses, (gr. ¼—½ 2nda, vel 3tia, quâque horâ,) carefully watching its effects, and giving it up if it seem rather to augment cerebral excitement, or to induce coma. Enemata containing ʒß of laudanum may be preferable in some cases; or combinations of camphor and henbane with musk and anti-spasmodics. The strength should be carefully supported by beef-tea, arrowroot, &c.: and if the patient have been accustomed to ardent spirits or opium, they may be allowed with great advantage in considerable quantity. The patient must be confined, if necessary, in order to prevent injury to himself or others; and he should be treated with calmness and indulgence, but yet with firmness. In the last stage, when coma supervenes, counter-irritation by means of sinapisms or blisters to the scalp, or feet, or calves of the legs, may be tried, but scarcely any means will avail.

CHAPTER III.

OF FEVER.

SECTION I.—OF FEVER GENERALLY.

General Description.—Fever consists in a derangement of most of the functions of the body; and considered in a surgical sense, it arises from sympathy with disease of some part. There are several species of fever, whose differences depend on diversities, of the local disease, or of the powers and irritability of the constitution. (1.) If there be acute inflammation in a healthy system, the fever will also be healthy *inflammatory*, or, as it is often called, *symptomatic fever*. (2.) If there be acute inflammation in a weakened or cachectic system—or if the inflammation arises from certain specific causes of a depressing tendency, such as morbid poisons,—or if it attack certain structures, as the veins;—the fever will be unhealthy or *irritative*. (3.) If inflammation have terminated in an exhausting suppuration, or if there be a permanent disease which the constitution has no power to vanquish, *hectic fever* will be established. (4.) When the vital powers are entirely exhausted, the fever assumes what is called a *typhoid* type; which, in the emphatic language of Hunter, is termed dissolution. (5.) Lastly, fever, even when arising from a local cause that is permanent,

may be *intermittent;* that is, may occur in definite paroxysms, with intervals of health.—This is often the case in diseases of the urinary organs, such as strictures and fistulæ in perinæo; and sometimes in worms or other states of irritation of the intestinal tube.

SECTION II.—OF INFLAMMATORY FEVER.

Syn.—SYNOCHA, Cullen.

GENERAL DESCRIPTION.—This fever accompanies every acute inflammation, which arises from a severe and considerable injury, or affects parts of great sensibility and importance in healthy subjects. And it is almost a natural and necessary concomitant. "Nature," says Hunter, "requires to feel the injury; for where after a considerable operation there is rather a weak quiet pulse, often with a nervous oppression, with a seeming difficulty of breathing and loathing of food, the patient is in a dangerous way. Fever shows powers of resistance; the other symptoms show weakness, sinking under the injury."*

SYMPTOMS.—Slight shivering; succeeded by increased heat of skin;† preternaturally frequent, hard, and vibratory pulse;—pain and aching in the head, back, and limbs, with a sense of lassitude and muscular weakness;—general deficiency of the secretions; dry skin; dry and white tongue; thirst; nausea and loss of appetite; constipation; scanty and high-coloured urine;—slight aggravation of the symptoms in the evening, often delirium in the night, and slight remission in the morning.

TERMINATIONS.—(1.) If the patient recover, the urine becomes more copious, and deposits a lateritious sediment;‡ the tongue becomes moist and clean, the skin cool and perspiring; the local inflammation either is resolved, or proceeds to a healthy suppuration; and the return of the appetite and of the other natural functions indicates the patient's recovery. The formation of pus often appears to be a natural crisis.§ (2.) But if from the irreparable nature of the disease or injury, or from the irritability of the system, life is destined to be destroyed, the pulse becomes continually more frequent, and subsequently weak, irregular, and intermittent, the

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* On the blood. Chap. iv. sect. 6.

† From increased determination of blood to it, and deficiency of the secretion which naturally carries off the heat. In ordinary symptomatic fever, the real heat of the blood does not rise more than three or four degrees above the natural standard; but in scarlet fever it has risen as high as 116°.

‡ *Lateritious*, like brick-dust, from *later* a brick.

§ Κρίσις, any important phenomenon in a disease (mostly an evacuation of some sort) by which the patient's safety or danger may be judged of.

extremities cold, and life soon ceases with the failure of the circulation.

TREATMENT.—The treatment of this fever is included in that of acute inflammation, of which it is the shadow. But it must be observed in this place, that when it is symptomatic of an inflammation that is unavoidable, (as after most severe injuries,) it cannot be cut short, although its undue violence may be abated;—and that great care should be taken not to weaken the patient too much, especially if the part injured be not of vital importance, and if its reparation will require time and strength. The indications are, to allay vascular action and nervous irritation, and to restore the secretions. And the means are, rest, low diet, aperient and febrifuge medicines, anodynes at bed-time when the bowels have been cleared, and general or local bleeding if demanded by the exigencies of the case.

CAUTION.—Although it is always expedient to open the bowels, yet purging should be avoided when it is likely that the disturbance which it occasions may be detrimental to any diseased or injured part, as a compound fracture, or the like.

OF THE PULSE.—This fever presents sundry modifications, according to the structure and functions of the part which is inflamed; and as these varieties are principally testified by the pulse, it is necessary to say a few words respecting it. The *elements of the pulse* are three, namely, the contraction of the heart, which propels blood into the arteries;—the yielding and dilatation of the artery, which when felt constitutes the *pulse**—and the return of the artery to its former calibre. Now some of the properties of the pulse depend on the heart, and some on the arteries. Thus its *frequency* and *slowness* correspond to the number of the heart's contractions in a given time, and its *quickness* (or *sharpness*) depends on the velocity and impetus with which each individual contraction is made. On the other hand, *hardness* of the pulse depends on the resistance offered to the ingress of the blood, by a constant spasmodic contraction of the muscular coat of the arteries;—and it is said to be *soft*, if that contraction is trifling, so that the vessel yields readily to the impulse of the blood, or the pressure of the finger. The *vibratory* feel, or *thrill*, or *jar*, is caused by an irregular dilatation of the artery, which dilates with an innumerable number of stops and interruptions. The *full* and *small* pulse depend in some measure on the quantity of blood in the system, but principally on the state of the vessel, for if that does not dilate freely, the pulse will be small.

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* If the artery be perfectly straight, and the circulation tranquil, the dilatations will not be so great as to be perceptible to the eye, and can only be appreciated by compressing the vessel slightly between the fingers; whereas if it be curved, each impulse of the blood will slightly straighten it, and cause a sensible motion.

In inflammatory fever, generally, the pulse is frequent, hard, and vibratory; and it will most probably be *full* likewise if any common part, such as skin, cellular tissue, or muscle, be inflamed: and if the constitution be sound. But if the inflamed part be essential to life, as the brain or stomach, or is connected to the latter organ by means of the sympathetic nerve, as the testicle and kidney, then the vital powers seem more depressed, and the pulse is smaller and more frequent;—but yet hard, the vessels still firmly embracing their contents.* The pulse may also be small in any inflammation, if the constitution be weak and irritable; and it will be soft and jerking, from a deficiency of arterial contraction, if debility be excessive.†

BUFFY BLOOD.—One of the most remarkable phenomena of inflammatory fever remains yet to be noticed; and that is the buffy coat of the blood. The reader need scarcely be reminded, that after healthy blood has coagulated, it divides into two portions, serum and crassamentum;—that the serum is a watery solution of the albumen and salts, whilst the crassamentum consists of the fibrine and red particles;—and that the fibrine, which by itself is yellowish white, derives an uniformly red tinge from the equal diffusion of these particles. But, on the other hand, the crassamentum of inflammatory blood has on its surface "*a buffy coat*," that is,a yellowish white layer of fibrine free from red particles;—which layer may vary from one line to one third of the clot in thickness, and is frequently so strongly contracted as to make its surface concave or *cupped*, and its edges fringed. We have therefore to inquire, first—what change in the blood causes this deviation from its ordinary appearance;—and secondly, what states of the system produce this change.

(1.) With regard to the first inquiry, there are four changes in the state of the blood which, together or singly, may be possibly concerned in the production of the buffy coat. First, a *slow coagulation*, so that the red particles have time to sink, and leave the upper surface of the clot colourless. Secondly, an *increased specific gravity of the red particles*, so that they have an unusual tendency to subside quickly. Thirdly, a *disposition of the fibrine to separate* itself from the mass of the blood. Fourthly, an *increase in the quantity* of the fibrine. Now the *first* of these conditions, namely, the slow coagulation, is generally admitted to exist in inflammatory fever, "when the powers of life are unimpaired, the circulation rapid, and the blood drawn in a full stream."‡ But still, as Hewson says, "something more than merely a lessened disposition

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* Wilson Philip. Experimental Inquiry into the Laws of the Vital Functions, p. 323, 3rd edition.

† Hunter on the Blood. Chap. iii. sect. 8.

‡ Copland, Dict., Art. Blood.

to coagulate is necessary for forming the crust or size,"* because if blood be confined by ligatures in a vessel of a living animal, or if an animal die a sudden and violent death, although in both these cases the blood will coagulate very slowly, it still will be free from the buffy coat. The *second* condition, namely, increased gravity of the red globules, was proved by an experiment of Hunter's,† but as it was soon after disproved by Hewson, who repeated Hunter's experiments with a totally opposite result, no great weight can be laid upon it. The *third* alleged cause, the spontaneous separability of the fibrine, is established on better evidence. "The blood in inflammation," says Hunter, "more readily admits of a separation of its visible parts;" and the fibrine (which was assumed by Hewson to be highly attenuated) may be seen to rise as a scum, and give a bluish appearance to inflammatory blood very soon after it is drawn. The *fourth* condition, the increased quantity of fibrine, has been proved to exist, by the experiments of Thackrah and others. But whilst some authors assert that it is increased at the expense of the albumen of the serum, and that the serum of inflammatory blood contains less albumen than usual; others, as Gendrin, affirm that the serum is preternaturally albuminous.‡ From a due consideration of these circumstances, it appears most probable that the buffy coat depends on some change in the vital properties of the blood, by which the fibrine is disposed to separate from the mass;—the other conditions also being accessory, if they exist. The *cupping* is easily accounted for by the strong contraction of the buff; for the crassamentum of inflammatory blood is always extremely dense and firm, although there may be no buffy coat whatever.

(2.) In the second place, we have to consider by what states of the system these changes in the blood are produced. Hunter says that they are produced by an increase of the powers of life, and by an increase of the disposition to act with those powers. And we have both positive and negative evidence that this is correct. For the buffy coat is found on the blood of healthy pregnant women and animals, in whom the powers and actions of life are augmented without doubt; and it is always most conspicuous when the circulation is rapid, and when the blood is drawn in such a manner as to preserve its vital properties; that is, in a full rapid stream, into a deep vessel, the temperature of the apartment being high.

On the other hand, the buff will be deficient, when the blood is

* Hewson; Experimental Inquiry into the Blood. Lond. 1772. Chap. ii. pp. 34 *et seq.*

† Hunter says also that the serum is specifically lighter than usual.

‡ Albumen and fibrine are almost identical in chemical composition; and the former when coagulated can scarcely be distinguished from the latter.

drawn in such a manner as to deprive it speedily of its life; that is, in a small slow stream, into a flat and shallow basin, the temperature being low. It will also be absent at the commencement of some cases, when the intensity of the inflammation oppresses the nervous system, and the circulation is slow, and labouring, and embarrassed; and especially if the respiratory organs be affected: but it may appear as soon as the oppression is removed by a full bleeding. Thus, during one venæsection, the blood first drawn has not been buffed, owing, as we presume, to the embarrassed circulation;—the buff has appeared in a second portion when enough has been drawn to relieve that embarrassment;—and has again disappeared in a third, when the circulation has become languid at the approach of syncope.

Finally, the buffy coat, considered as an evidence of fever or inflammation, is, like every other symptom that our conjectural art presents us with, not to be depended on invariably. For it may be present when there is no inflammation;—as in the pregnant; in the plethoric; in those accustomed to be periodically bled; and in persons who are habitually exposed to the night air.* And its quantity is by no means proportioned to the intensity of inflammation; for it is constant to the last in rheumatism, even when subdued by bleeding. And it may not be present at all, even when inflammation exists intensely; as in the commencement of sundry cases before mentioned; and in inflammations that have little of the adhesive tendency, as those of mucous membranes, or diffuse inflammation of the cellular tissue; or where the blood coagulates imperfectly, as in the inflammations arising from specific malignant sources, or in the course of typhus fever.†

SECTION III.—OF IRRITATIVE FEVER.

General Description.—The term Irritative Fever seems to be conventionally assigned to a form of violent and dangerous constitutional disturbance, which apparently partakes of the characters of inflammatory fever and of prostration with excitement; and which is perhaps scarcely to be distinguished from the early stage of typhoid fever. There is violent local inflammation, with extreme febrile commotion; but there is in addition evidence of great depression of the vital powers; as though the constitution were

* Samuel Cooper. First Lines of Surgery.

† Palmer's edition of Hunter. Vol. iii., p. 39, *note*.

‡ Some authors state that the blood is most buffed when there is an inflammation with considerable tendency to effusion of fibrine, as pleurisy or pericarditis; others state that it is most buffed when the inflammation has no adhesive tendency, as acute rheumatism, so that the fibrine cannot escape from the blood. A curious instance of contrary deductions from the self-same facts, when partially viewed and hastily generalised.

yielding to the disease, but exhausting itself in impotent efforts to overcome it. This fever attends phlebitis; it attends the diffuse inflammation of the cellular tissue;—and the disease arising from glanders, and from wounds poisoned during dissection;—also inflammations in which there is great pain from the confinement of matter. In conjunction with diffuse cellular inflammation and phlegmonous erysipelas, it may be induced by the slightest common injury in constitutions vitiated by unhealthy diet or residence, or by exposure to miasmata. This was the disease that committed such ravages in the Plymouth dockyards in 1824, and which Dr. Butter entitled Irritative Fever, in his learned and elaborate work on the subject.

The *Symptoms* and *Treatment* will be particularised under the head of the various local affections which this fever accompanies; the leading features are great restlessness and anxiety, debility, depression of spirits, weight at the præcordia, oppressed respiration; frequent rigors; rapid and sharp pulse, but variable in force: death, preceded by low delirium, and signs of great exhaustion. The treatment must, as a general rule, be directed to the invigoration of the vital powers by cordial stimulants and tonics, the evacuation of depraved secretions, and the removal of pain and irritation, and of local disease, by whatever measures are most appropriate.

SECTION IV.—OF HECTIC FEVER.

DEFINITION.—Hectic fever is an habitual disorder of the system, when irritated by some long-standing disease, or source of weakness which it is unable to remove. It is a remittent fever, and is accompanied by a general tendency to increase of one or more secretions.

SYMPTOMS.—Emaciation and debility; tongue morbidly clean, and red at the tip and edges; appetite often inordinate, disposition alternately to diarrhœa and profuse perspiration;* pulse frequent and small;—a febrile exacerbation comes on every evening (or oftener, especially after meals) with slight chills, followed by heat of skin, burning of the soles of the feet and palms of the hands, and a circumscribed flush in the cheeks;—thirst and restlessness, preventing sleep till after the middle of the night, when the patient falls asleep, and suddenly wakes in a profuse perspiration;—often buoyancy of spirits and hope to the last.

TERMINATIONS.—(1.) If it be about to terminate fatally, the debility increases; the diarrhœa and perspirations become more profuse and exhausting; the legs become œdematous; apthæ form; and

* Called *colliquative*; (*liquo*, I melt;) because they exhaust the system.

great pain, griping and tenesmus attend the diarrhœa, owing to an inflammatory or ulcerated condition of the intestines. The patient may expire suddenly, the heart failing from mere debility; or death may be preceded by typhoid symptoms. And this fatal termination may be owing either to the continuance of the original disease, or to the induction of secondary disease in the lungs, or mesenteric glands. (2) Recovery from hectic is often remarkably rapid, if the causes be removed; provided that no secondary disease has commenced.

Causes.—Any chronic organic disease, which is incurable;—whether from its *nature*, as scirrhus, tubercle;—from its *seat*, as the lungs or mesentery:—from its *extent*;—or from *constitutional debility*; also exhaustion from profuse suppuration;—or from any other great and continued discharge;—as prolonged lactation, leucorrhœa, and so forth. Hectic so frequently arises from suppuration, that an absorption of pus was formerly deemed to be its invariable and efficient cause. Hunter denied this theory—1st, because hectic may arise from organic disease, or from excessive discharge of any secretion where there is no suppuration; 2ndly, because pus may be absorbed (as it often is from chronic abscesses, buboes, &c., which are discussed without being opened) without the production of hectic.* But although it is certain that absorption of pus is not the *only* cause of hectic, it is equally certain that pus is absorbed from extensive sores, and that it adds to the constitutional debility; and that (especially if it be vitiated or decomposed) it tends greatly to the production of colliquative diarrhœa, and ulceration of the intestines, from whose surface it is most probably eliminated.†

Treatment.—The indications are (1) to remove the local cause; (2) or if that be impracticable, to enable the system to support it. The first indication may often be fulfilled by an operation; and it is well known that hectic patients often bear operations extremely well, recovering from them rapidly, and making but one step as it were from death's door to perfect health.‡ In cases not admitting or requiring an operation, local mischief must be remedied, and profuse discharges restrained as far as possible. As for the second indication, the strength must be maintained by a mild nutritious diet; that is, as much food may be given as the stomach can digest with comfort; and wine, porter, or beer, may be allowed in order to assist digestion; but the quantity of animal food and of spirituous liquors must be regulated, so that

* On the Blood. Ch. ix. sect. 1.

† Copland; Dict. Pract. Med., Art. Hectic, p. 965.

‡ "The removal of a diseased part which the constitution has become accustomed to, and which is rather fretting the constitution, is adding less violence than the removal of a sound part in harmony with the whole." Hunter on the Blood, ch. ii. sect. 2.

they may not add to the excitement, nor increase the heat of skin, thirst, and perspirations. Arrowroot and other farinaceous preparations; jellies, Iceland and carragee moss, are useful as mild nutritives occasionally; taking care, however, that these slops be not given at such times or in such quantities as to interfere with the digestion of more solid food. *Tonics* may be given to support the strength; such as bark, quinine, or cascarilla; or sometimes the preparations of iron; but if at any time, in the varying progress of the disease, excitement appear to prevail, the pulse being more accelerated, and pain aggravated, tonics and animal food must be for a time exchanged for saline medicines and farinaceous or milk diet. *Digitalis*, a remedy much abused in hectic, may be of service at such times, if given in a few moderate doses, for not too long a time. Ten minims in a saline draught, with or without morphia, at bed-time, are a proper dose. Change of air is always advantageous. Profuse perspirations may be checked by dilute sulphuric or nitric acid, with tonics, as in F. 1.* As it will be recollected that the diarrhœa often depends on an inflamed or ulcerated condition of intestinal mucous membrane, reason will suggest that attempts to stop it by port wine and large doses of catechu, or other stimulants and astringents, will often be not only unavailing, but irritating and mischievous;† although good enough in cases of mere debility. The proper remedies are, demulcents and anodynes; rest in bed; occasionally a poultice of bran with one fifth of mustard, applied to the abdomen, and suffered to remain till it causes slight smarting and redness;—the very mildest diet of milk, arrowroot, &c., enemata of starch, containing from twenty to sixty minims of laudanum;—Dover's powder at bed-time, and small doses of chalk mixture, with a few minims of laudanum during the day; and one or two grains of blue pill, with three or four of rhubarb occasionally, if the liver is inactive.

SECTION V.—OF TYPHOID FEVER.

General Description.—This fever is an acute form of constitutional disturbance, occurring when the powers of life are much exhausted or depressed. It may be a sequel of the hectic: or of the state of prostration with excitement; or it may supervene very soon after an injury.

Symptoms.—Pulse very frequent and weak, often quick and jerking in the early stages; skin hot and very dry; all the secretions deficient; tongue dry, brown, and tremulous; lips parched; —if there be a wound, it becomes dry, livid, and glassy, and ceases to suppurate.

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* Vide Appendix of Formulæ.

† The author has known large doses of catechu purge violently, when administered to a young woman for passive menorrhagia.

TERMINATIONS.—(1.) If the patient is to die, the pulse becomes more rapid, thready, and tremulous. and at last is imperceptible at the wrist; the eyes look dull and glassy and sunken; and the temples and nostrils are pinched, from atony of their muscles;—the patient lies on his back, and sinks toward the foot of the bed;—there is frequent hiccough, with tympanitic distension of the abdomen, and relaxation of the sphincters; the patient dozes imperfectly, awaking with a start; he picks imaginary objects ont he bedclothes, and mutters to himself;—there is starting or twitching of the tendons; at last the skin becomes cold and clammy, respiration slow and laborious, and coma supervenes, soon followed by death. (2.) If recovery occurs, the surest sign of amendment is a diminution of the frequency and increase of the firmness of the pulse, with sound sleep; the patient being sensible and composed, the eyes brighter, the tongue cleaning, and above all, suppuration returning, if there be a wound.

CAUSES.—Typhoid fever may be caused (1) by some circumstance producing immediate and direct depression of vital power; as where it supervenes on a recent injury or operation after a brief inflammatory stage, (which is not unlikely to happen in patients who meet with an injury in what is called a rude state of health;)—or where the typhoid follows the irritative fever in cases of snake-bite, or wounds poisoned in dissection;—or where it accompanies traumatic gangrene. (2.) It may be caused by some disease of long standing, which has completely exhausted the constitutional powers—as profuse suppuration with hectic. And both these conditions may be, and frequently are, combined with a third; (3) namely, contamination of the blood by putrid or other poisonous matter. Thus it is sure to supervene if putrid pus be confined in an abscess, or if putrid urine escape into the cellular tissue of the perinæum. And the researches of M. Bonnet, which will be more fully spoken of in another place, have proved incontestably that the hydrosulphate of ammonia, the product of putrefaction, is absorbed in these cases, and is one cause of the typhoid fever.

PROGNOSIS.—The prognosis will of course be always doubtful; but there may be a chance of recovery, if the cause is of recent existence and admits of removal; whilst there can be scarcely any, if the constitution has been exhausted by its long continuance. Thus if this fever come on in erysipelas, or small-pox, or soon after an injury, or from extravasation of urine, it may be curable; but it scarcely will be so, if caused by chronic abscess or disease of a joint, and preceded by hectic. And thus it differs most essentially from the hectic, which may be often removed almost instantly by the removal of its cause. But if the hectic has been suffered to pass into the typhoid, the season of amputation is also past. "It is," says Hunter, "the more incurable, as it is more connected with the past than with the present;" that is to

say, it is dependent on the mischief which the disease has already produced, more than on that which it is now producing.

TREATMENT.—The indications are to remove the cause; allay irritation, and support strength. If the removal of the cause is likely to be successful, upon the principles already laid down, it should be done without delay; and even if not, it may be better to try a doubtful remedy than none at all.

As for the general treatment, opium or some of its preparations should be given in small doses, repeated frequently, or in a large dose at once, according to the judgment of the practitioner, for the relief of restlessness and delirium. The most potent tonics, especially quinine, should also be freely given. The author can particularly recommend F, 2. 3. Moderate quantities of concentrated forms of nutriment, jellies. broths, beef-tea, arrowroot, &c., and wine or hot brandy-and-water, need not be spared, if the patient will take them. Hiccough is best relieved by a tea-spoonful of sp. æther. c.; and flatulence by an enema of turpentine. The catheter should be used if necessary.

CHAPTER IV.

OF TETANUS.

DEFINITION.—Tetanus is a disease manifested by tonic spasm and rigidity of some, or many, of the muscles of voluntary motion.

DIVISIONS.—There are several varieties of tetanus. (1.) It is divided into the *idiopathic*, or that which arises solely from some disorder of the system, and the *traumatic*, or that which is caused by a wound. (2.) It may be *acute* or *chronic*; the former arising suddenly, and soon terminating;—most frequently fatal;—and affecting the whole body; the chronic being of less intensity, of longer duration,—mostly terminating in recovery;—and partial in its extent. (3.) Tetanus may be *general* or *partial*; and when partial it is mostly confined to the neck and jaws, constituting *trismus*, or locked jaw. (4.) It may be divided according to the set of muscles predominantly affected; being called *opisthotonos* when the body is curved backwards so as to rest on the occiput and heels, which it most commonly is; *emprosthotonos*, when it is curved forwards from a preponderance of the abdominal muscles;*—and *pleurosthotonos*, when it is drawn to one side, this

* Larrey conceived that the curvature of the body was determined by the situation of the wound; that if the wound was on

being the most uncommon.† (5.) The *trismus infantum*, or *neonatorum*, which attacks children soon after birth, is usually made a distinct species. (6.) It may in its *type* be *intermittent*, when it is caused by marsh miasmata, as it may be occasionally, like almost every other nervous affection.

PREMONITORY SYMPTOMS.—In the true traumatic tetanus, there are seldom any premonitory symptoms, except sometimes severe shooting pains in the wound;—the genuine idiopathic is mostly preceded by foul tongue, loss of appetite, disturbed sleep, dejected spirits, and fugitive spasms in various parts;—and in one well-marked set of cases that will be more fully alluded to hereafter, the attack is preceded by shivering, pain in the head, back, and limbs, and other symptoms of inflammatory fever.

SYMPTOMS.—The patient first complains of stiffness and pain of the neck and jaws, as from a cold; and his countenance has a peculiar expression, because the angles of the mouth are drawn upwards and outwards; and the angles of the eyes are puckered by incipient spasm of the facial muscles; next, the muscles of mastication and deglutition become fixed and rigid, so that the mouth is permanently closed, and there is great difficulty of swallowing, especially liquids. To these symptoms succeed a fixed pain at the epigastrium, and convulsive difficulty of breathing, indicating that the diaphragm is affected; and the spasm now extends to the other muscles of the trunk and limbs, rendering them completely fixed and rigid: the abdomen feels remarkably hard; there is obstinate constipation, and frequently difficult micturition from spasm of the perinæal muscles; the pupils are contracted, and the saliva flows from the mouth, because the patient is unable to swallow it. This spasm never ceases; but it has occasional remissions of violence, alternating with aggravated paroxysms, which are easily induced by the slightest irritation or disturbance. Meanwhile the intellects are undisturbed, and the pulse may be natural, except during a severe paroxysm, which quickens it, and causes perspiration and thirst.

TERMINATIONS.—(1.) If the case be about to end *fatally*, the paroxysms become more frequent and violent, and the breathing more and more embarrassed by spasm of the diaphragm and of the muscles of the glottis; and at last the patient dies, either from exhaustion or from suffocation;—the respiratory actions

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the posterior surface there would be opisthotonos, and so forth,—an opinion greedily seized by those who advocate Bellingeri's theory, that the posterior columns of the spinal cord preside over extension, and the anterior over flexion. But although this is sometimes the case, it is quite as frequently otherwise. (Clinique Chirurgicale, Paris, 1829, p. 85.)

* A case of acute tetanus, affecting one side only, is given in the Med. Gaz., May 12th, 1838. No mention is made of the pulse.

having been suspended so long as to cut off from the brain the necessary supply of arterial blood, and so induce insensibility. The most usual *period of death* is the third or fourth day; sometimes it is postponed till the eighth or tenth, but rarely longer. On the other hand, there is the case * recorded of a negro who injured his hand, and died of tetanus in a quarter of an hour; and cases of death within twenty-four hours are by no means uncommon. (2.) When acute tetanus terminates favourably, still the patient's recovery is not complete for weeks or months;—partly because of the strainings and lacerations which the muscles have suffered,—partly because of the remaining tendency to spasm, which very slowly yields, and is apt to be temporarily aggravated by very slight causes, especially cold and damp. But in some rare instances the disease has been removed almost instantaneously by the removal of its exciting cause.

Prognosis.—The prognosis in acute tetanus is extremely unfavourable, especially if traumatic; it is more favourable in the idiopathic, and the chronic most generally gets well of itself. Death very seldom occurs after the twentieth day. Dr. Parry† attempted to found a prognosis on the state of the pulse, and thought that if on the fourth day it was under 100 or 110, the patient being an adult, the prognosis was favourable;—but if above 120, unfavourable. But although it is true that the pulse is in general accelerated towards the close of the malady, still some fatal cases have occurred in which it never rose above 80 or 90. As a general rule it may be said that the prognosis is *favourable* if the complaint be partial;—if it do not affect the muscles of the glottis;—if the pulse be not much accelerated;—if it has lasted some days without increasing materially in severity;—if it be sensibly mitigated by the remedies employed;—if the patient sleep;—and if he have been subject to it before in an intermittent form. On the other hand, it will be *unfavourable*, if the spasms continually increase in severity, and especially if they affect the muscles of the glottis.

Diagnosis.—Tetanus resembles *hydrophobia* in the difficulty of swallowing and aggravation of the spasms by slight external irritants; but it may be distinguished by the spasms being *continuous*, and by the patient being sensible in general to the last;—whereas in hydrophobia, there are fits of general convulsions with *perfect intermissions*, and the patient is mostly delirious, with a peculiarly wild haggard expression of countenance. *Inflammation of the spinal cord*, or its membranes, resembles tetanus in having opisthotonos and spasmodic difficulty of swallowing; but it may be distinguished by the pain in the back, and fever being

* Rees's Encyclopædia, Art. Tetanus.

† Caleb Hillier Parry, M.D. Cases of Tetanus and of Rabies Contagiosa. Bath, 1814.

more predominant than in any case of mere tetanus, and by the paraplegia and coma which supervene in most cases.

Morbid Anatomy.—The morbid appearances that have been found in different cases are as follow. Increased vascularity of the membranes and substance of the *spinal cord*, with or without effusion of serum; more rarely the same appearances have been found in the cranium;—flakes of cartilage and spiculæ of bone deposited in the membranes of the spinal cord;—vascularity of the nerves leading from the wounded part;—vascularity of the mucous membrane of the stomach;—of the sympathetic ganglia;—and congestion of the lungs. But there is not one of these morbid changes that is constantly, and, except the first, there is not one of them that is even frequently found. The muscles are extremely rigid after death, and ecchymosed or ruptured in many parts;—the blood is mostly uncoagulated.

Predisposing Causes.—The best established predisposing causes are;—changes of temperature from warm to cold or damp;—a disordered state of the stomach and bowels;—the presence of worms, or of undigested food, or vitiated secretions in the intestines;—the existence of the above-named osseous or cartilaginous deposits, or of any other permanent cause of irritation near the spinal cord;—fear or fatigue, or any other circumstances that depress either mind or body. Tetanus is much more prevalent and fatal in warm than in cold or temperate climates; and men are much more frequently subject to it than women.

Exciting Causes.—The *exciting causes* of tetanus may, for the sake of convenience, be arranged under three heads. (1.) Those which operate on the whole system, or the nervous system generally, as cold and damp;—terror and anxiety;—the poisons of nux vomica, of the cicuta aquatica, and other narcotico-acrid poisons, especially a certain Javanese poison called *chetik*. (2.) Causes which affect organs supplied with ganglionic nerves, especially the stomach or bowels;—and there can be little doubt but that many of the cases which are styled traumatic, because there exists a wound, are in reality caused by this visceral irritation, without which the tetanus could not have arisen. Thus in a case, which occurred in St. Bartholomew's Hospital, ten days after a wound on the toe, and proved fatal in a fortnight, no morbid appearances, not even an increase of vascularity, were found in the spinal cord; but almost all the intestinal canal was inflamed, and there were ulcers in the ilium and cœcum.* Dr. Dickson† and Mr. M'Arthur‡ relate cases in which the intes-

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* There were vascularity and serous effusion in the cranium, brought on most likely by the large doses of opium which he took. Med. Gaz. vol i. p. 646.

† Med. Chir. Trans. vol. vii. p. 459.

‡ Ibid. vol. vii. p. 474 et seq.

tines were filled with a peculiar unhealthy yellow viscid secretion;—Mr. Abernethy* commemorates the peculiarly unhealthy stools, like sloughs, in a case which he observed;—Mr. Travers† strongly suspects that dysentery and ulcers of the intestines may be coincident causes;—and some authors‡ have affirmed that intestinal worms are a strongly predisposing, if not really efficient, cause. But besides, cases might be quoted, from various authors, in which there was no wound at all,—gastro-intestinal irritation was the only cause. Thus Andral§ relates a case, produced by gastritis; Lehman,‖ a case of partial tetanus by hernia; and another instance is related,¶ in which it was caused by the irritation of an emetic on a stomach disordered by habitual drunkenness. But although irritation of the stomach and bowels is the most frequent of this class of causes, still irritation of other organs may produce the disease. Begin** states that it has arisen from pericarditis; and Farr†† knew it caused by pulmonary abscess. Uterine irritation is by no means an uncommon cause. Whytt‡‡ gives the case of a girl, aged twenty, who caught cold during the menstrual period, and died of tetanus in eighteen hours; and the author has lately been informed of a most lamentable case of fatal trismus from irritation of the womb. §§ (3.) The third class

* Lectures on Surgery. Renshaw, London, 1835, p. 23.

† Travers. Further Inquiry concerning Constitutional Irritation. London, 1835, p. 397.

‡ Laurent. Vide F. Pescay, Dict. de Sc. Med. 55, p. 9.

§ Many others may be found in F. Pescay.

‖ Quoted in Wenceslai Trnka de Kr'zowitz Commentarius de Tetano, Vindobonіæ, 1777—the very best work on the subject extant.

¶ Fournier-Pescay in Dict. de Sc. Med. Paris, 1821. Article Tetanos.

** Dictionnaire de Médecine et Chirurgie Pratiques. Paris, 1836. Art. Tetanos.

†† Quoted in Trnka, Op. Cit.

‡‡ Quoted *ibid.*

§§ A young lady miscarried in the second month of pregnancy; but as the abdomen continued to enlarge, and the breasts to fill, and the menses to be absent, it was surmised that one ovum only of a twin had been expelled, and that the other was proceeding in the regular course of developement. About the fifth month she was seized with violent flooding, which yielded for a time to the ordinary remedies, but recurred repeatedly. Soon after this she was suddenly attacked with stiffness of the jaws, spasmodic difficulty of swallowing, and spasm of the glottis. A physician-accoucheur was now called in, who introduced bougies into the womb, with the view, as he said, of inducing delivery; this manifestly aggravated all the symptoms. The other remedies used were ca-

of causes are wounds and external injuries of every description, especially lacerated and punctured wounds of tendinous parts, as the hands and feet; gunshot wounds; compound fractures, compound dislocation of the thumb; wounds irritated by foreign matters, or in which nerves are exposed. Tetanus has followed a blow with a pedagogue's ferrule;* but it is rarely if ever caused by clean simple incisions. There are three periods at which tetanus may be induced by wounds, viz. (1) it may supervene immediately, or very soon after the infliction,† if the patient be predisposed; (2) during the progress, when the wound is occasioning severe and continued irritation; (3) when it is nearly or quite cicatrised, and this is perhaps the most frequent period: whether the cessation of the discharge of pus induces the disease, or whether some tension of the nerves from the contraction of the cicatrix, (as surmised by Trnka and Travers,) or some other circumstance unknown. Tetanus is sometimes also induced suddenly by cold, as well as by the poisons before mentioned.

Pathology, or Theory of the Disease.—In this part of the subject we must inquire, 1st, what is the seat of tetanus; 2ndly, what is its nature; and 3rdly, state whatever pathological deductions may fairly be established.

1. The *seat of tetanus* must evidently be that portion of the nervous system from which the voluntary muscles derive their ordinary stimulus to contraction;—namely, the motor columns of the spinal cord and medulla oblongata, as high as the third nerve. For, as *all* the muscles may be implicated, the seat must be some part capable of affecting them all.

2. With regard to its *nature*, we may ask, is it inflammatory? Some authors‡ hold, that it uniformly and essentially consists in

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lomel and opium; she was not bled, as she had been much reduced by the flooding. She died in two days from the accession of trismus, having become comatose. On a post mortem examination, the womb was found swelled and congested, but containing no ovum; the other abdominal and thoracic viscera were healthy; the base of the brain and cervical portion of the spinal cord immensely congested and loaded with serum. Similar cases are to be found in Trnka. See also Cooke's Morgagni, vol. i. p. 129; and the Lancet for June 2nd, 1838.

* Morgan's Lecture on Tetanus; a graphic portraiture of its horrors.

† Hunter says that small wounds may excite tetanus speedily, but that large ones only predispose. Small injuries will produce effects that larger ones will not;—thus a violent bruise will not excite laughter like a slight tickling. Lectures in Palmer's Ed. vol. i.

‡ Especially Begin and Fournier-Pescay. As a curious instance of medical discrepancy, we may observe that the latter of

inflammation of the spinal cord or its membranes, and they call it a *tetanic myelitis*, and so forth; the arguments in favour of their doctrine being, (1) that tetanic spasms do actually occur in genuine myelitis; and (2) that congestion in the cord and its appendages are the most frequent morbid appearances observed. But, on the other hand, it may be urged that tetanus is *not always inflammatory*; (1) because congestion of the cord is far from invariably found; and when it is, it may in some instances be considered rather an effect of the disease than its cause; (2) because fever is by no means constantly present; (3) and most conclusively, because tetanus may co-exist with a state of depression and collapse, in which it would be impossible for inflammation to be established.* As, therefore, it certainly cannot be said that tetanus depends necessarily upon inflammation, it can only be said that it consists in some unknown change in the spinal cord, whereby it spontaneously excites contraction in the voluntary muscles;—which contraction, in a healthy state, is only produced by the stimulus of the will, or by some impression on a sentient nerve.

Although, however, it is most certain that inflammation is not essential to the existence of tetanus, still it is equally certain that there is one class of tetanic cases which present a well-marked inflammatory character: they commence with shivering and pain, are attended with fever, and if fatal, often display, on inspection, congestion, serous effusion, softening or purulent deposit in some part of the brain or spinal cord.† But if we except this class,

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these authors affirms that fever is invariably present, and that those who say otherwise cannot have seen the disease: whereas he himself in another place states that it may occur during the great collapse which immediately succeeds an injury; a condition quite incompatible with fever.

* "I have observed, sometimes after severe gun-shot wounds, attended with great disturbance and stunning, (*fracas et commotion*,) and after considerable hæmorrhages, a state of constant atony (*atonie*) during the course of tetanus. The pulse was slow, intermittent, small, and thready;—stupor and apparent insensibility preceded the spasms, and, so to say, announced them. The tetanus was universal, but the rigidity and tension of the muscles were moderate. This state was of but short duration; death occurred in fifteen or twenty hours." Fournier-Pescay, Op. Cit.

† The following are examples. (1.) Case in which the disease was caused by a blow on the back of the neck—next day patient was seized with shivering and fixed pain at the injured part—pulse 130, and full—death in thirty-six hours. Head found loaded with blood, and cervical portion of the cord softened. Med. Gaz. vol. i. p. 645. (2.) A cavalier cut his hand, and applied cold—

(which is by no means a majority,) and the very small class of cases in which there exists collapse, the remainder cannot be associated with any morbid condition of the circulating system.

3. It must be concluded, therefore, that tetanus is merely a manifestation of functional disorder in one department of the nervous system;—and that it may strictly be compared with every other disorder of that system, whether of *motion*, as chorea, epilepsy, and convulsions;—or of *sensation*, as every variety of pain;—or of *consciousness*, as every grade of mental aberration; for, like them, it may co-exist with and be caused by the most opposite states of vascular action, and by every sort of morbific cause; fear, grief, cold, mechanical injury, sympathetic disorder, and poisons. Like them it is too often uncontrollable by medicine,—and is more fatal, only because it interferes more with actions that are essential to the maintenance of life.

TREATMENT.—The treatment comprises both local and constitutional measures; the indications are, to remove all irritants, and lessen the diseased actions. In the *local treatment*, the first points to be accomplished are,—to remove all extraneous bodies from the wound, if there be one;—to make apertures for the free discharge of pus;—to make incisions for the relief of inflammatory swelling and tension;—and if any isolated portion of nerve or tendon happens to be on the stretch, to divide it. Then a strong watery solution of opium, or of extract of belladonna, may be applied, and the whole part should be enveloped in large soft poultices. Sundry other measures have been proposed, in order more effectually to remove local irritation: such as the division of the nerve leading from the wound; or it is a better plan, where practicable, to make a Λ incision above the wound so as to isolate it and cut off as much nervous communication as possible, as has been proposed by Mr. Liston. But, as Mr. Curling* observes, it happens, unfortunately, that the tetanic condition of the spinal

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was immediately seized with shivering and fever and tetanus—was bled, but died in fourteen hours. Fournier-Pescay, Op. Cit. (3.) Patient was labouring under simple continued fever from cold and wet—tetanus came on after a week, with aggravation of fever and pain in the head and back; treated successfully by large bleedings, warm bath, purgatives, and mercury. Burmester in Med. Chir. Trans. vol. ii. (4.) A man after violent exercise was seized with rigors—fever—pain in forehead—emprosthotonos, and subsequently opisthotonos—was bled, but died comatose in five days—serum and blood found effused between the membranes of brain; cervical portion of cord softened. Francesco in Annali di Medicina, Jan. 1825, and Forbes's British and Foreign Review, Jan. 1838.

* A Treatise on Tetanus, being the Jacksonian Prize Essay for 1834. By T. Blizard Curling. London 1836, p. 122.

cord, when fully established, is mostly independent of its local exciting cause, and does not cease on its removal. Hence *amputation* of the injured part has very rarely been successful, and has even aggravated the mischief; so that, as a general rule, it ought not to be performed, unless desirable for other reasons, independent of the tetanus.

We must next review the *constitutional remedies* that have been employed in tetanus, stating their relative utility, and the cases in which they are most likely to be beneficial.

1. *Bleeding* has been employed with the most decided benefit in many cases, in which it may be presumed that there existed the inflammatory diathesis already spoken of. And in all such cases, or if the habit be full, and the wound hot, swelled, and painful, bleeding from the arm, and cupping from the spine, are clearly indicated. And even if there should be no inflammatory diathesis, provided the patient be young, bleeding may be performed in *moderation*;*—both to prevent congestion, and to facilitate the absorption and operation of remedies. But, in by far the majority of cases, it should not be employed at all; for its influence on the muscular system is but secondary; and though it may diminish spasm for a time, it consumes the materials of life, and hastens death from exhaustion.

2. *Purgatives* are always indicated, unless there is some known cause to the contrary;—both because there is always obstinate constipation, and because worms, or vitiated secretions in the digestive tube, may be among the exciting causes: and the most active ones must be chosen. Thus, at the outset of the malady, a scruple of calomel mixed with butter should be put at the back of the tongue for the patient to swallow, and should be followed in an hour with a draught containing ℥j of turpentine and a similar quantity of castor oil, or by a drop or two of croton oil; and enemata of turpentine † should be frequently administered till the bowels are completely unloaded. The circumstances which forbid this use of purgatives, are previous disease of the alimentary canal; dysentery, ulcers, &c.; but even then there would be no objection to unirritating enemata.

3. *Mercury*, given so as to induce ptyalism, has often cured tetanus; therefore two or three grains of calomel may be given every two or three hours; or large quantities of strong mercurial ointment may be rubbed into the thighs and legs.

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* Pelletier treated a case successfully after taking fourteen or fifteen pounds of blood; and Lisfranc in one case bled eight times, and applied seven hundred and ninety-two leeches: examples rather to be wondered at than imitated.

† A remarkable case of locked jaw, cured instantaneously by a turpentine clyster, is recorded in the M. C. T., vol. vi., by that learned and excellent physician, Dr. Phillips of Winchester.

4. *Tobacco* is well known to paralyse the action of all the muscles; and it has certainly proved more efficacious than any other remedy in tetanus. An enema, therefore, of four ounces of the *enema tabaci* (P. L.) should be given after the bowels are cleared, or without waiting for that, if the symptoms be urgent. It soon induces sleep, deadly sickness, cold perspiration, fainting, and relaxation of the muscles, followed perhaps by sleep. And the enema should be repeated twice or thrice a day, or oftener if its effects are not well marked, so as to keep the muscles constantly relaxed. But care must be taken not to let the pulse flag, and to administer hot brandy and water, or other stimulants, if the heart's action appear enfeebled.

5. *Cold* is of eminent service to animals affected with tetanus; and a soldier was once most unexpectedly cured by exposure all night in severe weather. It may therefore do good in some instances to apply cold extensively to the surface by means of bladders filled with various frigorific mixtures; taking care to support the circulation by internal stimulants. But the cold bath, or cold affusion, although they are of great service in chronic tetanus, are most hazardous in the acute, and have more than once proved instantly fatal.

7. *Tonics*, especially the muriated tincture of iron, quinine, &c., are likely to be of great service in asthenic cases. They should be given in large doses every two hours it being, as important to support a right action as to diminish a wrong one.*

8. *Opium* is of most undoubted efficacy in some instances, although it is not easy to lay down indications for its employment. When it produces good effects, they are soon manifest. The best way of using it appears to be by frictions with liniments containing it: or by removing a small portion of cuticle with a blister, and sprinkling a grain of acetate, or hydrochlorate of morphia, on the denuded cutis. Very large doses may be given without any effect.

8. It is in all cases necessary to keep up the strength by beef-tea, wine, arrowroot, &c., especially towards the close of the malady. Mr. Travers believes that more patients have been lost from want of nutriment than from want of medicine.

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* Travers, Second Inquiry. The subcarbonate of iron is well called by Mr. Travers a "most inconvenient form." It is difficult to conceive the use of giving it in such quantities that it passes unaltered through the intestines,—as was the case with Frazier, one of the tetanic patients treated with it by Dr. Elliotson. By the way, it is amusing enough to compare the parallel reports of this case, given by Dr. E. in M. C. T. vol. xv., and by Mr. Tyrrel in his edition of Sir A. Cooper's Lectures, vol. iii. The former ascribes the patient's recovery to the iron; the latter, to an evacuation of pus from the foot.

9. *Colchicum* has been much praised by Mr. Smith of Hayti, and appears likely to be of benefit in idiopathic cases brought on by cold.

Besides these, there is a host of other remedies, such as camphor, belladonna, musk, digitalis, stramonium, æther, castor, assafœtida, &c. &c., on which it would not be worth while to dilate. They may have done good in some isolated cases, but no reasonable person would trust in them, to the exclusion of more active remedies.

There is often considerable difficulty in administering food or medicine, in consequence of the spasmodic closure of the jaws, and occasional impossibility of deglutition. The former difficulty may be overcome by passing an elastic catheter through the nose, or behind the last molar teeth. But if the attempt at swallowing is attended with much spasm, or induces dyspnœa, it must be abandoned, and our remedies be introduced solely through the skin and large intestine. The operation of forcing the teeth asunder, technically called "spouting," should by no means be attempted. It is unnecessary and barbarous, and can scarcely be accomplished without breaking or pushing out the front teeth; which, if the patient recover, would be a most unsightly disfigurement.

There is a poison called *wourali* or *woorara*, used by the Indians of Guiana to poison their arrows, which, when introduced in inconceivably minute quantities into the circulation, instantly suspends the functions of the brain;—sensibility and consciousness are lost, and the movements of respiration cease, but the heart continues to beat for a little while after this apparent death. If, however, respiration be kept up artificially, so as to maintain the purity of the blood, the heart will continue to beat, and after a time the nervous system will recover its suspended faculties, and life will be restored.* This desperate experiment has been performed by Mr. Sewell in two instances on animals affected with tetanus, and with perfect success;† for the nervous system, when it recovered from the poison, was perfectly free from the disease. The same practice has therefore been proposed by Mr. Morgan to be hazarded in the human subject when afflicted with hopeless tetanus;—the poison to be introduced into a small wound in the finger,—a ligature to be placed above, so as to regulate its admission into the system;—and as soon as apparent death has ensued, artificial respiration to be kept up assiduously till signs of reanimation appear. The author would certainly prefer this treatment for him-

* An ass that was experimented on in this manner more than ten years ago, is still living (August 1838) in the possession of the illustrious naturalist of Walton Hall. Vide Waterton's Wanderings.

† But unfortunately one of the animals, a horse, died subsequently of repletion, and the other, an ass, of inanition.

self, sooner than die in the agonising spasms of the disease; but he would not easily be induced to practise it upon his patients, or to recommend it to his readers.*

* A most unique and preposterous remedy is recorded in Trnka, (p. 444.) A ship was trading on the coast of Angola in 1763, and a native boy, who was ill with tetanus, had been treated for some days without benefit by the ship's doctor. His case was considered hopeless, when one of the savages cured him in the following extraordinary manner. He made a small wound in the thigh, into which he inserted a pipe, and then blew with all his might, till the whole body was inflated with emphysema. Strange to say, the boy recovered from that moment.

PART II.

OF INFLAMMATION AND ITS CONSEQUENCES.

CHAPTER I.

OF THE GENERAL PHENOMENA OF INFLAMMATION.

DEFINITION.—Inflammation may be defined to be a state of increased vascularity and sensibility, with a tendency to morbid secretion and change of structure.*

SYMPTOMS.—The symptoms are redness, pain, heat, and swelling, with impaired function of the inflamed part;—and each of these symptoms requires a few observations in detail.

A. The *redness* is owing to the increased quantity of blood in the inflamed part; for all the vessels are dilated, and the red particles pass into capillaries that before conveyed only serum. When inflammation is acute, the redness is of the bright scarlet tint of arterial blood; when chronic, it is of a darker venous hue; and in certain specific inflammations it is purple or copper-coloured. Again, in healthy inflammation, it is gradually diffused, and lost in the neighbouring parts, whilst it is abruptly circumscribed in some forms of specific inflammation.† There are several terms used by authors to express its varieties, degrees, and appearances.‡ Thus, 1. It is called *ramiform*, when seated in the small arteries and veins only, and not in the capillaries. 2. It is said to be *capilliform* when *some* of the capillaries are also distended. 3.

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* P. H. Berard, Dict. de Med. vol. xvi. Paris, 1837.

† Hunter's Works by Palmer. Vol. iii. p. 330.

‡ Carswell, Illustrations of the Elementary Forms of Disease. Lond. fol. 1837.

It is *uniform*, when *all* the capillaries are injected; as in erysipelas. 4. It is *punctiform* when occurring in minute dots; as when the villi of a mucous membrane are injected, but not the mucous tissue itself. 5. It is called *maculiform*, when the blood is either extremely accumulated, or else extravasated at certain points. This form of redness accompanies hæmorrhagic inflammation.

B. The *pain* is supposed to be caused by a greater sensibility of the nerves, and by their being disturbed by the distension of the blood-vessels;—or it may be a simple disorder of sensation, accompanying the disorder of nutrition and function. It differs in its character and intensity according to several circumstances, but principally according to the part which is inflamed. Thus it is burning, or tingling in the skin; throbbing in the cellular tissue; sharp and lancinating in the pleura;—a mere sense of heat and soreness in the bronchial mucous membrane; and extremely dull and oppressing in a part largely supplied with ganglionic nerves;* —as the stomach, kidneys, or testicles. It is always less severe if the fluid products of inflammation can readily escape, than if they are confined;†—and comparatively slight if the part inflamed be yielding and extensile, but most severe if it be hard and dense, as bone or ligament; although these structures possess very little sensibility in health. It is also in general greater in common inflammation than in specific, with the exception of the gout. It may be the first symptom noticed, or it may be preceded by the redness. Again, it may be entirely absent; as where inflammation occurs in a healthy constitution, and merely produces adhesion;‡ or where inflammation, although disorganising, is very insidious and indolent, as in scrofula;—or where the patient's mental and physical sensibility have been benumbed by the habitual abuse of intoxicating liquors.§

C. The *heat* of inflammation was proved by Hunter to be a mere effect of the increased afflux of blood. For it is most remarkable in inflammation of those parts which being furthest from the heart are naturally the coldest; and in them it does not rise so high as the mean temperature of the blood;—whilst in internal parts, whose heat is uniform, and not depressed by external vicissitudes, it does not rise at all.‖ Further, there is no heat generated in inflammations of cold-blooded animals. But still some au-

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* Palmer's Hunter, vol. iii. p. 334.

† Berard, Op. Cit.

‡ Adhesions are often found between the pleuræ after death, that never were suspected during life.

§ Latham, Lectures on Subjects connected with Clinical Medicine.—Lecture vi.

‖ Palmer's Hunter, vol. iii. p 338.

thors * maintain that more heat than ordinary is actually *produced* in inflamed parts, because more liquid will be evaporated by them in a given time, than by healthy parts of equal temperature;—although the thermometer will not indicate a higher degree of heat, because of the power possessed by living bodies of resisting an increase of heat.

D. The *swelling* is caused at first by the increased quantity of blood, and subsequently by the effusion of serum, lymph, and pus. It is most remarkable in loose textures; also in the breast, testicle, and lymphatic glands.

E. The *impairment of function* which inflammation produces, consists at first in an increased irritability and morbid sensibility of external impression; but, subsequently, of an utter incapability of performing the usual offices, in consequence of structural change.

F. Inflammation may produce every possible alteration of secretion. 1. As to *quantity;* secretion is invariably diminished at the commencement of inflammation; but often increased at its close, as is the case with mucous membranes. 2. In *chemical composition;*—as the tears which in certain cases become hot and scalding, and excoriate the cheek. 3. The secretions may be *mixed* with the products of inflammation; thus mucus is often mixed with blood, serum, lymph, and pus. 4. Gas is sometimes secreted in inflamed tissues.

ALTERATIONS IN STRUCTURE.—Inflammation is capable of altering all the mechanical qualities of parts. 1. The *weight* is always increased if the inflammation be recent, and if it have not existed long enough to induce atrophy. 2. *Cohesion* or *hardness* is always *diminished* in acute inflammation, although this is apt to be overlooked in consequence of the increased density. This softening arises from the serum which infiltrates the tissues; and is always most remarkable when there is the least cellular tissue to contain the serum; as in the brain. Hardness may be increased in chronic inflammation; sometimes because the whole bulk of the part is shrunken; sometimes because of the organisation of lymph. Hardening from chronic inflammation was formerly termed *scirrhus.* 3. *Transparency* and *polish* are always impaired.

MORBID ANATOMY.—The ordinary *post mortem* appearances of recent inflammation are, redness, softening, swelling, and infiltration with serum. It is necessary, however, to make a few observations respecting these phenomena, and especially concerning redness; because, 1, it may disappear altogether after death—2, it may be simulated by redness from congestion which existed during life—3, it may be simulated by certain appearances produced after death.

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* Berard, Op. Cit. James on Inflammation, p. 239.

1. Redness, if very slight, may disappear from inflamed skin after death; but if the blood-vessels were injected, the vascularity would be found increased; besides that the part would be softened, and slightly infiltrated with serum, and that the epidermis would peel off more readily than natural.

2. Redness may have been caused during life, not by inflammation, but by congestion, from an obstacle to the return of blood; and congestion may also be attended with softening, and serous effusion, so that in some instances it cannot be distinguished at all from inflammation, and in others not with certainty. The general distinction is, that in congestion the larger veins are distended more than the capillaries, and previously to them; whereas it is the reverse in inflammation. The diagnosis will also be aided by observing whether there is any cause of obstruction to the nervous circulation.*

3. The redness of inflammation may require to be distinguished from certain appearances produced after death. And these may be produced, (1.) By the *action of the capillaries*, which persists long after that of the heart has ceased; so that the arteries are emptied, and the blood accumulated in various internal organs, especially the lungs and spleen. (2.) By *gravitation*; by which the most depending parts of the body, and especially of the lungs, are always more or less congested. (3.) By *transudation* of the serum and colouring matter through the coats of the vessels in incipient putrefaction; which is a frequent cause of red spots and stains on internal surfaces, and of collections of bloody serum in the various cavities. But the author's space does not permit him to dilate upon these topics; they are merely adverted to for the purpose of showing, that redness, swelling, softening, and serous effusion, (unless accompanied by some more decided effect of inflammation, such as lymph or pus,) must not be hastily received as evidences of it; seeing that they may be produced by other causes, both before death and after it.

Effects and Terminations.—Inflammation has only one genuine *termination*; namely, *resolution*, or recovery; the inflammatory action subsiding, and the part returning to its former state; —but, beside resolution, it may have either of the following six terminations, or *effects*, or *consequences*, as they ought rather to be called. 1. *Hæmorrhage*; an escape of blood from the distended vessels. 2. *Effusion of serum*. 3. *Effusion of fibrine*, or of *coagulable lymph*, constituting *adhesion*. 4. *Suppuration*, the formation of a peculiar fluid called *pus*. 5. *Ulceration*; the disappearance or removal of the inflamed part. 6. *Mortification*, or its death. To each of these effects a chapter will be devoted.

Forms of Inflammation.—Inflammation may be divided—

* Andral, Anatomie Pathologique, tom. i. p. 56.

1. Into *healthy* and *unhealthy*;—the former being that which naturally ensues in healthy constitutions, when a part of the organisation is impaired;—being restorative in its tendencies, and injurious only if excessive or misplaced. Whereas the unhealthy is essentially destructive, and has no spontaneous tendency to recovery. 2. Into *common* and *specific*; the common arising from ordinary causes acting on healthy constitutions;—the specific arising, either because the constitution is unsound, as in scrofula, so that (to use Hunter's words) it gives or reflects back upon the part inflamed a diseased disposition or action;—or because it is produced by a cause which is specific; as the poisons of small-pox or syphilis. 3. It may be divided into *acute* and *chronic*, the acute being sudden in its seizure, violent in its action, and rapid in its progress;—the chronic being less violent and more tardy. Acute inflammation is sometimes called *active*; and the term *passive* is applied to chronic inflammations in weak constitutions. 4. It may be classified according to its tendency to produce particular local effects; thus we speak of adhesive, suppurative, hæmorrhagic, ulcerative, and gangrenous inflammation.

Modifications.—Inflammation will always be modified by the state of constitution in which it occurs; being active and rapid in the young and healthy; but more indolent, and tending to destructive processes (such as ulceration and mortification) in the aged and debilitated. But its most important modifications are derived from the *structure of the parts* which it invades; for it has a special tendency to a different termination in almost every different texture. Now all parts capable of being inflamed may be divided into two orders;—first, those which have no natural outlet, as the serous cavities, and the cellular tissue of the body generally;—secondly, those which have; as the skin and mucous membranes. In the *first order*, inflammation is more disposed to produce adhesion than suppuration; so as not only to render less likely the production of pus in a cavity from which it could not escape, but also if suppuration should occur, to limit the extent of suppurating surface, and circumscribe the fluid and prevent its diffusion. But the *second* order of parts is more liable to an inflammation that spreads;—which has a tendency to produce suppuration before adhesion; because suppuration is but a trifling evil, compared with the danger that would ensue if the mucous canals were closed by adhesive matter, from the slight inflammations to which they are perpetually subject. Yet if inflammation be of extreme *violence*, or if there be something particularly morbid in its *cause* or in the *constitution*, the natural precedence of these two effects will be inverted. Thus in violent inflammation of mucous membranes, as croup, lymph is poured out on the surface; — and inflammation of the cellular tissue, arising in a vitiated habit, or from a morbid poison, (as after dissec-

tion wounds,) may induce a diffused and widely spreading suppuration, which is not limited by adhesion.

PREDISPOSING CAUSES.—The predisposing causes of inflammation may be connected with the constitution, or with the part. To the former belong plethora; the sanguine temperament, and excess in food and drink. The latter are chiefly over-stimulation, or exertion beyond power; besides previous disease, or congenital weakness of organisation.

EXCITING CAUSES.—The exciting causes may be divided into two classes. 1. Those which act primarily on the *structure* of a part;—as mechanical and chemical injuries of all sorts. 2. Those which act primarily on its *functions* and *vital endowments*;—as over-exertion;—and the poisons, such as cantharides, which affect living matters only. The former class act *directly*; that is, they inflame the part which they are applied to: the latter class may act *indirectly*; just as cold applied to the feet causes inflammation of the lungs. The former also act *immediately*; whilst some of the latter may take some time (which is called the stage of incubation) to produce their effects. Lastly, causes may be *common* or *specific*;—the former being those which are daily met with, and which can act on all constitutions;—the latter, being unable to affect all constitutions, being peculiar in their origin, and producing a modified inflammation, with a specific train of consequences.

DIAGNOSIS.—It must be understood that both the primary elements of organisation are concerned in inflammation, namely, both blood-vessels and nerves;—it must also be understood, that although either of these elements, if disordered, will tend to implicate the other, still that one of them may for a long time be deranged solely. Inflammation, therefore, requires to be distinguished from two states; 1, from disordered circulation, in the form of *congestion*, or *determination of blood*; 2, from disordered nervous influence, which is called *irritation*. The former produces redness and swelling, and, if active, heat;—the latter causes pain. (*a*) *Congestion*, or stagnation of blood, produces more or less weight and pain, with disturbance of function, especially of secretion; but it does not cause fever like acute inflammation, nor interstitial deposition like chronic;—although it may terminate in either.* (*b*) *Active determination* of blood may be a normal process, as in the ovaries during impregnation; when morbid, it causes excitement and functional derangement. Instances of it are seen in the injected capillaries of the intestines in cholera, and in headaches from excitement;—in many cases it seems but to be the first sign of incipient inflammation. (*c*) *Irritation* of the

* The red noses of drunkards present instances of permanent congestion, distinct from inflammation.

nerves is a peculiar state, attended with severe pain, and followed by increased afflux of blood. The irritable breast, irritable testicle, tic douloureux, neuralgic toothache and headache, and the mock inflammations which occur in weak, irritable, and hysteric subjects, (especially from abuse of blood-letting,) are all examples. The pain of nervous irritation may in general be distinguished from that of inflammation, by its sudden accession and subsidence; —by its being often relieved by measures that would aggravate inflammation, such as pressure, friction, &c.;—by the pain being severe out of all proportion to heat, redness, and swelling, even if they exist at all;—and by the absence of local disorganisation.

PATHOLOGY OR THEORY OF INFLAMMATION.—This division of our subject embraces two points of inquiry;—namely, 1st, What are the real *phenomena* that occur in inflammation;—and 2ndly, What is the *essential nature* of those phenomena.

I. The phenomena of inflammation have been repeatedly investigated by means of the microscope, after they have been excited in the transparent parts of animals;—the web of the frog's foot, or mesentery of the rabbit for instance. And the following are the results of these observations. It appears, (1.) That the application of mechanical or chemical irritants at first causes the capillaries to diminish in calibre;—the blood to circulate in them with greater velocity, and the part to appear paler and more transparent. (2.) That if the application of the irritant be prolonged, or if it be of much intensity, the capillaries dilate, the blood moves in them more slowly, acquires a darker tint, and at last loses all appearance of globules, and coagulates; whilst to the eye the part seems preternaturally red, opaque, and vascular. (3.) That some irritants, if very acrid, (and especially common salt,) may produce this state of dilatation immediately, without any previous contraction. (4.) That if the action of the irritant have not been too violent or prolonged, *resolution* may occur when it is removed;—the capillaries contracting, the blood again resolving itself into globules, and circulating with its natural rapidity and freedom. (5.) That when inflammation has been created. and the capillaries have become dilated through the agency of one irritant, (common salt for instance,) the application of a different one (as nitrate of silver or alcohol) will often cause them to contract, and accelerate resolution. (6.) That soon after the commencement of inflammation, the cellular tissue of the inflamed part becomes more or less loaded with *serum*, which exudes from the distended capillaries;—that if it continue, *fibrine* or coagulable lymph (known by its faculty of coagulating spontaneously) will next be effused into the interstices of the tissue;—that if it still continue, the stagnant blood in the capillaries, and the lymph in their interstices, become yellow and granular, and gradually soften down into *pus*;—and lastly, That if the inflammation be exceedingly intense, the blood in the capillaries becomes completely black, and afterwards yellowish brown;

the tissue becomes soft and flaccid, and in fact *mortifies*. (7.) That according to the observations of Broussais, the blood-globules rush, as it were, to an irritated point, even through the parietes of the veins, making new channels for themselves;—and that upon creating a new focus of irritation, near an inflammation that is already established, some of the stagnant globules rush from the latter to the newly irritated point. (8.) That although, in the immediate limits of the inflammation, the blood moves very slowly, still that in the adjoining parts it is supplied in much greater abundance, and is circulated with much more rapidity than natural.

II. It would not be compatible with the scope of this work to give a detailed account of the various theories that have been invented respecting the *proximate cause* or *essential nature* of inflammation. Of the older writers, some attributed it to a *lentor* or viscidity of the blood;—others to an *error loci*, that is, an obstruction of the capillaries by the entrance of globules too large to pass through them. Cullen supposed that it consisted in spasm of the extreme vessels. Hunter ascribed it to an increased action;—Wilson Philip and Hastings to a debility;— and Mr. J. W. Earle to an obstruction of the capillaries. Considering, however, that in every inflammation both the blood, and the blood-vessels, and the nerves are implicated;—and that we do not yet understand, and probably never shall understand, their relative influences and functions in ordinary healthy nutrition;—how can we hope to find a simple term that shall express the real nature of their derangements in inflammation?*

CHAPTER II.

OF ACUTE INFLAMMATION.

DEFINITION.—Acute inflammation is that which is sudden in its origin, violent in its action, and rapid in terminating; and it is attended with fever, either if it be considerable in its extent, or if it

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* Vide Cullen's First Lines, book ii., chap. i., sect. 2. Hunter on the Blood, (especially the admirable edition by Mr. Palmer.) Thompson's Lectures on Inflammation; Gendrin, Histoire Anatomique des Inflammations; Andral, Anatomie Pathologique; Wilson Philip's Treatise on Fevers, and Experimental Inquiry into the Laws of the Vital Functions, 3rd ed.; Mayo's Outlines of Physiology, 5th ed.; and the papers by Mr. J. W. Earle in the 16th vol. of the London Medical Gazette.

affect parts of great sensibility and importance, or if the constitution be highly irritable.

TREATMENT.—In the *treatment* of acute inflammation and its attendant fever, the *indications* are, to allay the morbid excitement of the vascular and nervous systems, and to restore the secretions.

I. BLOOD-LETTING, OBJECTS OF.—The first and most important measure is general blood-letting;—which, if carried far enough, induces a state of insensibility, and a suspended circulation, to which the name *syncope*, or *fainting*, is given. Now it requires to be understood, that this suspension of the heart's action depends upon two causes; *first*, on the abstraction of its natural stimulus, the blood;—*secondly*, and principally, on a peculiar sedative influence transmitted to it from the brain, when the latter does not receive its due share of arterial blood. And although the mere loss of blood *per se* may be of service (when that fluid is morbidly abundant) by relieving the system from a source of excitement, still the principal good effects of bleeding in inflammation depend on its sedative effects on the brain, and through the brain on the heart. And as it is often absolutely necessary to bleed persons in acute diseases who are extremely debilitated, it is of importance to produce as much of that sedative effect with as little loss of blood as possible.

MANNER OF BLEEDING.—For this purpose the blood should be drawn as quickly as possible *—from a large orifice;—and, above all, the patient should be in the erect posture. For if he be recumbent, the flow of blood to the brain will be assisted;—and if it be drawn slowly, the vessels will have time to adapt themselves to their diminished contents, and the bleeding might be continued almost to death without the occurrence of faintness.

QUANTITY TO BE TAKEN.—The objects to be pursued in bleeding, and the manner in which they are to be attained, having been spoken of, the quantity that should be taken next requires comment. As a general rule, the blood should be permitted to flow till paleness of the lips, lividity about the eyes, sighing, nausea, fluttering pulse, and relief of the pain, indicate the *approach* of syncope; but *full* syncope should always be avoided, for reasons that will presently appear. Then the patient may be suffered to lie down, and should be kept perfectly quiet, without any attempts to restore the circulation by stimulants;—that so the inflamed capillaries may resume their natural calibre, whilst relieved from the influx of the circulation.

TOLERANCE.—The quantity required to produce syncope varies according to the age, sex, and temperament of the patient. The *tolerance* (or power of bearing bleeding) is less in the very young and old than in the middle-aged;—less in the female than in the

* About ℥viii ought to flow in three minutes.

male;—and less in the nervous and lymphatic temperament, than in the sanguine and phlegmatic. But the *tolerance* is besides affected most remarkably by the existing disease. Thus it has been ascertained by Dr. Marshall Hall, that 15 oz. is the average quantity that will produce syncope in an adult if healthy; but that in some diseases much more requires to be taken, and in others much less.

Reaction.—After the depressing effects of bleeding there naturally ensues a degree of reaction; the pulse rising in frequency, and the local pain returning; and this reaction will be the greater if the venæsection has been carried to the extent of producing full syncope;—hence the importance of stopping short of this point. This reaction is, if possible, to be prevented by appropriate sedatives; but if, notwithstanding, well-marked inflammatory symptoms return, the bleeding must be repeated till the disease is permanently vanquished;—provided that the strength permit.

Indications for Bleeding.—But as general venæsection is not to be resorted to indiscriminately in every case of acute inflammation, a few words must be said on the principles that regulate its employment. And there are three things to be considered; viz. 1st, the patient's strength, and state of his constitution; 2ndly, the part affected; 3rdly, the nature of the exciting cause, and amount of the injury which has produced the disease.

(1.) With regard to the state of the constitution, bleeding is most required, and best borne, when *temperament* is sanguine, or that mixture of the sanguine and phlegmatic termed rustic;—when the *muscles* are large and firm;—when the blood-making powers are vigorous and the circulation strong, as indicated by redness of the face and lips, and by a full, hard, and frequent pulse. On the other hand, it will be borne *worse* when the muscles are large and flabby, and the pulse habitually open, soft, and full. And it will be borne worst of all, when the complexion is sickly and pale;—the pulse, quick, small and feeble;—the lips, conjunctiva, and tongue pale. And if there should happen to be a state of passive dilatation and weakness of the heart, syncope would most likely be instantly fatal;—and if there should be any organic disease which impedes the formation of blood, its loss is liable to be followed by irrecoverable sinking and exhaustion. *Fat people* generally bear bleeding worse, and in fact contain less blood, proportionably to their bulk, than those of a spare, lean habit and rigid fibre.

The propriety of a *second bleeding* must in a great measure be determined by the effect which the first has had on the pulse; for if that be more frequent and quick, or more sharp and jerking,* instead of slower and softer, it would seem that the bleeding had

* As if the artery had lost its contractile power, and yielded more to each impulse of the blood.

diminished the strength more than it had reduced the disease. The state of the blood must also be regarded; for if the surface of the coagulum be flat, and its consistence loose, the vital powers are depressed, further bleeding will be injurious, and the case must be committed to the other antiphlogistic powers.

(2.) Respecting the *part affected*, it may be observed that the necessity for venæsection, and its beneficial effects, will be greater in proportion as the *tolerance* is greater;—and that it would be indispensable where the organ affected is important to life, or to its enjoyment; whilst it might not be so, if an equal degree of inflammation affected an unimportant part;—and that its good influence in inflammation of a vital organ will often be marked by a rise in the strength and fulness of the pulse.

(3.) With regard to the *nature of the cause*, bleeding is not well borne when that is such as to produce great depression of the vital powers, as in the case of dissection wounds;—nor when the inflammation itself causes great depression, as in phlebitis;—nor in the case of an injury requiring great constitutional efforts for its restoration, as a compound fracture;—or if the disease be advanced towards suppuration or gangrene.

II. Evacuant Sedatives.—Under this title may be included a number of antiphlogistic remedies, which reduce vascular excitement, either by increasing certain secretions, or by some specific lowering agency independent of any evacuation,—most of them being capable of acting in both manners. (*a*) *Purgatives* are admissible at the commencement of all cases, except when they would cause irritation or disturbance of a diseased or injured part, as might be the case in wounds of the alimentary canal, and in compound fracture. Those should be selected which excite free secretion from the liver and intestines, and evacuate them rapidly: such as a good dose of calomel, followed by F. 4. (*b*) *Mercury* reduces the heart's action, restores the secretions, and excites the absorption of diseased products; it is chiefly advantageous in inflammations of serous structures, with a tendency to adhesion. The best form for its administration is calomel, of which from one to five grains may be given, at intervals of from two to six hours, till a *slight* affection of the mouth is manifested; which should be kept up by smaller doses if necessary; but all violent salivation is an evil. The calomel should be combined with opium or hyoscyamus, to prevent it from purging too freely. (*c*) *Antimony* is another direct antiphlogistic; it may be administered in doses of $\frac{1}{6}$-$\frac{1}{2}$ grain, with each dose of calomel and opium; in larger doses, such as gr. ii., it is a most potent remedy, especially in pneumonia; it does not cause vomiting after the first few doses, but exerts its sedative influence without producing any evacuation. (*d*) *Colchicum* is a remedy of precisely the same character; it is most useful in gouty and rheumatic affections. It may and frequently does produce bilious stools; but it is a vulgar error

to suppose that they are indispensable to its good effects. (*e*) *Nitre* and the other salines, as in F. 5, may also be given with great advantage; they abate heat and thirst, purify the blood, and increase the secretion of urine.

III. SEDATIVES NOT EVACUANT.—These remedies reduce fever and inflammation, by acting on the nervous system without increasing the secretions; they are hyoscyamus, conium, and digitalis, the two first of which in particular are of eminent service, when combined with calomel and antimony, (F. 6.) to prevent reaction, and soothe pain in inflammatory cases attended with great nervous irritability.

IV. NARCOTICS.—*Opium* primarily decreases the secretions, and increases vascular excitement; hence it must not be given in acute inflammation till after bleeding; but then a large dose (such as gr. ii.) may be given in combination with five of calomel, to allay pain and prevent reaction. But it is the *sine qua non*, and may be given without reserve in inflammations occurring in very debilitated habits, such as peritoneal inflammation from perforation of the intestine, or other cause, after fever, or after profuse hæmorrhage.

The warm bath acts in every way analogous to opium, and requires the same precautions; viz. as it stimulates before it soothes, it must be preceded by evacuations, if the habit be plethoric. The proper temperature is 97° Fahrenheit, and it should be continued long enough to induce complete relaxation.

V. The *diet* in acute inflammation should, as a general rule, be of the least stimulating nature. But although water-gruel and tea might for many days suffice for the robust and plethoric, the starving system must not be indiscriminately applied to children, or the old or debilitated; on the contrary, their strength must be supported by mild fluid nutriment, arrowroot, beef-tea, &c., and even by wine if necessary.

VI. *Regimen.* There must be a total avoidance of everything that would irritate mind or body. Perfect rest in the recumbent posture, and in a position as easy as it can be made;—cool air;—free ventilation;—the exclusion of light and sound;—with mental consolation, to allay doubts and fears, and inspire resignation and cheerfulness, are most potent aids to medical treatment, which without them would often be utterly fruitless.

LOCAL TREATMENT.—In the local treatment of inflammation, the first thing to be done is to remove all exciting causes if possible, and to place the part at perfect rest, in such a posture as will favour the return of blood from it; and then the indications are, to diminish the morbid heat and afflux of blood; to induce contraction of the distended capillaries, and to allay irritation and pain

1. The *local means of abstracting blood* are leeches, cupping, and scarifications. They may be sufficient in slight cases, or

where the constitution cannot bear general bleeding, or to aid and complete the effects of the latter; the sooner they are used after it, the better. A good leech is said to draw ʒss. of blood. In order to apply leeches, the part should first be washed, and if they will not stick, a little milk or blood should be smeared on it, or some small punctures should be made with the top of a lancet; and the leeches should be well dried in a cloth. The best plan of stopping hæmorrhage from leech-bites is to dip small pellets of lint in the tinct. ferri sesquichloridi, and press them on the holes for a few minutes. *Cupping*, when it can be adopted, is a more active measure, and relieves pain sooner than leeches. *Scarifications*, or *incisions*, are of use when there is great tension, as in phlegmonous erysipelas.

2. *Cold applications* are of use to diminish heat, and cause contraction of the capillaries; but they should be applied continuously, otherwise the pain will be aggravated when the heat returns. The best lotion is one containing lead and spirit, as F. 11.; it should be applied by means of a single piece of thin linen frequently changed; and care should be taken that the vapour may pass off freely, otherwise the cold lotion will soon be converted into a hot fermentation. In some severe cases ice, or frigorific mixtures, F. 12, may be applied in bladders.

3. *Warmth.* Very often cold adds to irritation; and perhaps in most cases *tepid* applications (85° Fah.) are preferable; they do not stimulate like heat, nor occasion painful reaction like cold, and are more directly sedative than either. *Warm applications* (92°—98° Fah.) are useful by relaxing the skin, soothing pain, and promoting perspiration, and are especially indicated in inflammations of dense tendinous parts.

4. *Stimulants.*—We have seen that some irritants produce contraction of the capillaries, when inflamed by the application of some others; and the action of nitrate of silver in purulent ophthalmia may be explained in this way.

5. *Counter-irritants.*—When one part of a frog's foot has been irritated and caused to inflame, if a neighbouring part be likewise irritated, some blood may be seen under the microscope to rush to it from the former. On this principle one inflammation is relieved by establishing another near it. Blisters (or rather the strong acetum cantharidis) are the best form of counter-irritants; but they should never be applied too near the disease, and never till its activity has been subdued by previous antiphlogistic measures.

CHAPTER III.

OF CHRONIC INFLAMMATION.

DEFINITION.—Inflammation is said to be chronic when it is gradual in its origin, slow in its progress, and tending to last long, or even indefinitely. Its *consequences* may be, adhesion, thickening, induration, ulceration, or suppuration.

CAUSES.—Its causes may be local or constitutional. Thus it may in the healthiest subjects be caused by any slight and continued irritant;—or it may be the sequel of acute inflammation, the vessels being left dilated, weak, and irritable. But it is more frequently the local manifestation of some constitutional disorder, such as general debility, with a tendency to local congestion,—or over-stimulation and plethora,—or disorder of some important organ, as of the stomach or liver.

TREATMENT.—The indications are, to remove all constitutional disorder, to allay local irritation, and restore the tone of the distended vessels.

1. In the first place, the patient's general appearance and condition must be examined. If he be bloated and plethoric, indulging freely in stimulating food and drink, and with unimpaired digestive organs, so that the blood is constantly formed in too great abundance, the diet must be lowered, and restricted principally to farinaceous articles;—free exercise must be taken in the air;—the bowels should be actively purged by a dose of calomel, followed by an aperient draught, and then a course of alterative medicine should be commenced, in order to regulate the circulation, increase the secretions, and relieve the system of its superabundant material. Plummer's Pill is an excellent form; it acts on skin, liver, and bowels; F. 7 has similar effects. Aperients should be administered occasionally, so as to carry off the mercury; such as seidlitz powders, or F. 8, 9; but, in severe and obstinate cases, it may be necessary to bring the constitution under the influence of that mineral, taking care, however, to desist at the least appearance of ptyalism, and maintain a gentle and continued, but not violent action.

2. But if the chronic inflammation occur in an enfeebled and irritable constitution, (as when it succeeds an acute attack that has been too actively treated by bleeding and mercury,) a nutritious and liberal diet must be adopted, with wine, to improve the digestion and vigour of the circulation; and slight sedatives to allay irritation or pain; the secretions of the bowels must be maintained by the gentlest laxatives; and if mercury be required to

keep up the biliary secretion, it must be given in small doses of the mildest forms, and at intervals.

3. Any marked disorder must be carefully sought for and rectified. If the tongue be furred and red at its tip and edges, with acid eructations, flatulence, and other signs of irritation of the stomach, the diet should be mild and plain, and small doses of alkalies in weak bitter infusion should be given thrice a day, with a blue pill every other night, and dose of rhubarb and magnesia every other morning. If the complexion be sallow and stools clay-coloured, a blue pill should be taken every night, with an aperient draught in the morning, and tonics in the daytime, provided they do not make the head ache. The action of the skin should be supported by warm clothing, the flesh-brush, the shower-bath, or by an occasional ten minutes' immersion in the hot bath; 92°—102° Fah. In females the uterine system must be regulated by the exhibition of steel, aloes, or other emmenagogues, if necessary. There are some remedies that seem to possess peculiar powers in chronic inflammation;—by supporting the strength and dispelling congestion;—serpentaria and ammonia in combination with bitter infusions;—very small doses of corrosive sublimate in combination with tincture of bark;—sarsaparilla, and the liq. arsenicalis, which is eminently serviceable in dry, scaly eruptions of the skin.

The *local treatment* of chronic inflammation has for its objects, to remove exciting causes, to unload the distended vessels and make them contract to their natural calibre, and to exercise the part in its proper functions, so that it may gradually resume the actions and sensations of health.

Local bleeding must be employed at intervals to unload the vessels, whilst they must be excited to contract by various stimulants and astringents; such as the sulphates of zinc, copper, and alumina, nitrate of silver, salts of mercury, &c. The application of cold by pumping is often highly serviceable. These or any other measures will be known to do good if they make the part feel stronger and more comfortable, although their first application may have been painful; but if they render it hotter and more vascular, it is a sign that they stimulate too highly, and may thus endanger the production of acute inflammation.

Counter-irritants are more useful in chronic inflammation than in the acute, especially those which establish a permanent suppurative discharge.

CHAPTER IV.

OF EFFUSION OF SERUM.

GENERAL DESCRIPTION.—This is the earliest and most constant effect of inflammation, occurring equally into the interstitial cellular tissue,—into the parenchyma of organs,*—from mucous and serous surfaces, and from the skin. If it is followed by any of the other effects of inflammation, it is always more widely extended than them all. But it may be the chief or only effect of inflammation, as in acute dropsy, which, whether it affect the cellular tissue or serous cavities, is an example of an inflammatory state rapidly producing serous effusion. The serum in these cases is always of greater specific gravity, and contains more albumen, than in dropsy from debility.† In patients of a lax, flabby habit of body, inflammation always produces more of this effect than in those of a firmer texture.‡

Hunter§ describes, under the term *œdematous inflammation*, a form of inflammation terminating rapidly in serous effusion, which occurs in those who are affected with dropsy, or disposed to it. It mostly attacks the lower extremities; the swelling is bright red, much diffused, very sore, but not throbbing. It is very apt to terminate in sloughing or suppuration, but not adhesion, and is the frequent cause of large ulcers on the legs of the dropsical.

TREATMENT.—The bowels must be well cleared; but other constitutional measures (whether antiphlogistic or tonic) must depend on the state of the system. The best local application is a tepid spirituous lotion, F. 13; leeches should be avoided, as they may cause ulceration and sloughing. If the part be much distended with fluid, a few punctures may be made with an acupuncture needle, as near the centre of the circulation as convenient.

After inflammation in any part, some degree of œdema is apt to remain in consequence of the distension and weakened tone of the capillaries;‖ and if the habit be weak, great œdema may arise from a very slight cause, as a blister.¶

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* Mayo, Outlines of Pathology, p. 428.
† Copland, Dict., Art. Dropsy.
‡ Andral, Anatomie Pathologique, vol. i. p. 320.
§ On the Blood. Palmer's Ed., vol. iii. p. 314.
‖ Hunter, op. cit. vol. iii. p. 331.
¶ Andral, op. cit.

TREATMENT.—Flannel or other bandages, gentle friction, cold affusion, and attention to the general health.

CHAPTER V.

OF ADHESION, OR THE PRODUCTION OF NEW TISSUES.

DEFINITION.—Adhesion may be defined to be the effusion and organisation of the fibrine or coagulable lymph of the blood,—an effect of inflammation which is observed under an infinity of circumstances, healthy and morbid, restorative and destructive.

TWO FORMS.—This effusion may occur under either of the two following forms: (1) the fibrine may be poured out by itself, as in iritis; or (2) it may be effused together with serum, as they naturally co-exist in the *liquor sanguinis;* and in this case the fibrine soon coagulates,—either forming a layer on the inflamed surface, or diffused in sheds and flakes through the serum.

THREE STAGES.—In the process of adhesion three stages are observable; in the *first*, the lymph or fibrine is recently effused, and as yet unorganised; in the *second* it becomes vascular and organised; in the *third*, it assumes the nature of some of the definite textures of the body.

First Stage. In the first stage, the fibrine, if examined, appears a soft and gelatinous mass;—originally diffluent, like thin mucus or cream, it gradually increases in consistence, and displays a reticular or cellular appearance, containing serum in its meshes, like the vitreous humour; and if that fluid be squeezed out, it seems like a mass of cobwebs moistened with water.* Its colour is yellowish white,—or pinkish if blood have been effused with it, or have begun to be formed in it.

Second Stage.—In this stage the fibrine becomes permeated with blood-vessels, which are often numerous enough to make it intensely red. Respecting the mode in which this process is accomplished, two opinions are entertained. Some suppose that the vessels are prolonged into the fibrine from the inflamed and softened surface to which it is attached;—or rather perhaps that blood-globules shoot into it in a continuous stream, and that the vessels are formed by a solidification of the fibrine around their

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* Carswell, op. cit.

track. Others conceive that the fibrine, like the vitellary membrane of the egg, has the power of forming blood within its substance;—that the blood so formed is endowed with a spontaneous motion, and forms channels through the plastic mass;—that these channels are crescentic in form;—that they increase in length as the blood increases in quantity;—till at length they reach and join the capillaries of the inflamed surface; one end becoming continuous with a minute capillary artery, the other with a capillary vein;—so that thus this newly-formed vascular loop participates in the general circulation. But it is probable that both these opinions are correct;—and that the currents of blood which permeate the new texture, are partly derived from its parent surface, partly generated with itself. The *time* which this process takes, varies according to the vigour of the constitution; it has been completed in man within twenty-four hours;* but in feeble habits it may require some days. It scarcely needs to be added, that lymph causes the adhesion of two surfaces, by its blood-vessels communicating with both. It is not necessary for the union of two serous surfaces, that both should be originally inflamed; for the contact of one inflamed surface will produce enough of inflammation in an adjacent sound one to make it participate in the effusion and organisation of lymph.

During this second stage, the fibrine may be the seat of various phenomena;—it may be pushed off and broken up by fresh effusions;—or it may secrete blood, or pus, or tubercle.

Third Stage.—In the third stage, the fibrine becomes completely organised, and assumes the character of some of the standard tissues of the body. And it is capable of being converted into almost any of them; the conversion in any particular case being determined by the surface from which the fibrine was effused, or by the function which it is made to perform. Thus, if a bone be broken or inflamed, the effused fibrine will be converted into bone. If a bone die, or is abstracted, still the lymph effused from the surrounding parts will become bone. If (as in the case of unreduced dislocation) the lymph is subject to frequent motion, part of it will be converted into bone, part into cartilage, part into ligament, so as to form a new joint. But there are some tissues which cannot be replaced; and then the lymph which they secrete is transformed into some other tissue, which occupies a similar place in other animals. Thus, muscle cannot be formed anew; but if divided, the uniting lymph will become ligament, or dense fascia-like cellular tissue, which occupy the place of many muscles in animals of inferior developement.

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* Sir E. Home. Practical Observations on the Treatment of Ulcer. London, 1835.

It appears that almost all the simple *tissues* are capable, if divided, of being thus united by a tissue similar to themselves, and of being to a certain extent restored, if partially abstracted. But complex *organs*, such as muscle or gland, do not enjoy this faculty.

All newly-formed tissues possess certain common properties. They are less vascular, and less endowed with vitality than the original;—they are more prone to run into disease during states of constitutional cachexy;* and they are liable (especially new cellular tissue) to shrink and become atrophied, or even (as in the case of pleuritic and peritonæal adhesions) to disappear altogether.†

The *parts most disposed* to the adhesive inflammation are the serous membranes, and shut cavities generally;—those least disposed to it are the mucous membranes; and in the latter, suppuration is the result of a less degree of inflammation than adhesion. But although the layers of lymph formed on mucous surfaces, when violently inflamed, (as in croup,) never become organised, but are detached by subsequent secretions of mucus or pus, still if two abraded and inflamed mucous surfaces are placed in opposition and left undisturbed, they may adhere;—as sometimes happens in the vaginæ of female children;—in the os uteri and Fallopian tubes of prostitutes, and in the ureters and biliary ducts when abraded by the passage of calculi.

The *uses* of the adhesive inflammation are infinite. It unites wounds;—it circumscribes inflammation in serous cavities, and in the cellular tissue, by preventing the diffusion of irritant fluids, whether the products of inflammation, (as pus,) or introduced by accident or injury;—thus it forms cysts for abscesses, and for foreign bodies;—and the readiness with which it occurs, is an excellent measure of the integrity of the constitution.

Adhesion, as it occurs in common parts, is not produced by a very violent degree of inflammation;‡ on the contrary, if there be more than a certain degree of inflammatory action, the lymph

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* Thus, in the scurvy, old cicatrices have been known to break out afresh into ulcers, and old fractures to become disunited.

† In examining the body of a madman who had stabbed himself in the abdomen fifteen different times during his life, the parts near the *most recent* wounds were found united by considerable false membranes;—at the situation of some that were older, there were only a few thin cellular adhesions; whilst, at the oldest, there was no trace of adhesion or false membrane whatever. Andral, Anat. Path., vol. i., p. 486.

‡ Insomuch that some denied it to be inflammatory at all.

effused will be broken up by fresh exudations, pus will be formed, and the process of reparation must be commenced anew by means of granulations, as will be described hereafter.

TREATMENT.—If it be the object to promote adhesion, the general principles of treatment are, to maintain the most perfect rest and apposition, and to use such local and constitutional measures as will prevent the inflammation from proceeding to a grade of greater intensity than the adhesive. In a few cases it may be necessary to excite vascular action, if insufficient for the production and organisation of lymph.

If it be wished to counteract the adhesive inflammation, then use must be made of the antiphlogistic treatment generally, and of calomel in particular.

If it be wished to remove adhesions, or thickening, the results of previous acute or existing chronic inflammation, the state of the constitution must be carefully regarded according to the principles laid down in the treatment of chronic inflammation. Plethora, or debility, or any other existing disorder, must be removed by appropriate remedies; whilst absorption is excited by the administration of the different preparations of iodine, or of mercury; the latter remedy being more to be depended on, and being often necessary to be carried to the extent of affecting the system. Such local means should also be used, if possible, as will make the circulation vigorous, and promote absorption; such as friction with the hand, or with the flesh-brush; aided by stimulating liniments, F. 14, or by ointments containing mercury or iodine; gentle exercise; passive motion, shampooing, pressure by bandages or otherwise; cold affusion, electricity, and galvanism; discutient lotions, especially those of zinc, F. 15, or muriate of ammonia, F. 16; blisters, or other counter-irritants—taking care not to reproduce active inflammation by too violent stimulation.

Is blood organisable?—It has been a matter of dispute, whether coagulated blood, like pure fibrine, is capable of becoming organised. Hunter believed that it was capable of being so, and in his work on Inflammation he adduced two cases which he thought to afford examples of it. The first is the coagulum in an artery that had been tied, in which he had been able to inject what he thought was an incipient vascular formation;—the second is a piece of coagulum adhering to a testicle, which he had certainly injected. Some succeeding pathologists, however, have denied that coagulated blood can ever become organised; and affirm, that whenever it is effused into the substance of a part, it is either absorbed, or removed by suppuration * as an extrane-

* Although it may be very reasonably believed that when a coagulum excites suppuration, it is rather because the surrounding

ous body. They allege in support of their objections, that in the above-mentioned injection of the coagulum in the artery, the coloured material was merely mechanically forced into the substance, and not distributed through any blood-vessels;—and that the supposed coagulum on the testis was merely effused fibrine.* And they further allege, that well-authenticated instances of organised coagula are extremely rare, or rather altogether wanting; whereas they ought to be common enough, because coagula are frequently placed under circumstances favourable for their organisation, if they were capable of it:—as for instance in the sacs of aneurisms; in sanguineous apoplexy, and in ecchymoses generally.

A reference, however, to facts can scarcely fail to show that Hunter's opinion was correct. For it may be seen that coagulated blood, whether contained in a tied artery, or in a serous cavity, or in an apoplectic cyst, first loses its colour,—then assumes a fibrous or laminated structure—adheres to the surrounding parts—is converted gradually into a cellular or cellulo-fibrous texture—and is in most cases, like lymph, ultimately absorbed. Although, however, it is incontestable that blood is capable of becoming organised, still it must be admitted that effused lymph is much more so;—and that lymph, and not blood, is the material employed by nature in the production of new tissues, and the reparation of injuries.†

CHAPTER VI.

OF INFLAMMATORY HÆMORRHAGE.

General Description.—Inflammatory, or *active* hæmorrhage, consists in the exhalation of arterial blood from the capillaries; either in consequence of local irritation or inflammation, or of general excitement and plethora. Its most frequent *seat* is the mucous membrane of the lungs, and it often appears accidental whether irritation of that membrane shall produce secretion of

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tissues are lacerated or injured, than from the non-vitality of the coagulum.

* It must be confessed that both these objections are tenable.

† Vide Palmer's Ed. of Hunter, vol. iii. Catalogue of the Hunterian Museum, vol. i., and Carswell, op. cit.

blood or of mucus. As the cases* of inflammatory hæmorrhage that fall under the surgeon's care are but few, it needs merely to be observed, that the *treatment* is essentially antiphlogistic;—that it consists in reducing the heart's action by bleeding (if it can be borne) and sedatives, of which lead is most useful;—and in diminishing the afflux of blood to the part by cold, rest, and an elevated posture. And it must be remembered, that it is less debilitating to employ one full venæsection, so that the cause may be at once removed, than to let the blood dribble perpetually away from the part in small quantities.

CHAPTER VII.

OF SUPPURATION AND ABSCESS.

SECT. I.—OF THE THEORY OF SUPPURATION, AND OF THE PROPERTIES OF PUS.

General Description.—It has been said that the first effect of inflammation is a general softening and effusion of serum;—and that the second effect is an effusion of fibrine, known by its property of coagulating spontaneously; but if the inflammation continue, these will be followed by the formation of pus;—whose properties and production must now be examined.

Properties of healthy Pus.—Pus is a yellowish white, opake fluid, of the consistence of cream;—free from smell, destitute of acid or alkaline reaction, and said to have a sweetish mawkish taste. It is insoluble in water, although freely miscible with it; has the specific gravity of 1.03, and coagulates at 165°. Its colour and opacity, like those of milk, are owing to the presence of an infinite number of small white particles, which float in a serous fluid. Respecting, however, the shape and size of these particles, there is much diversity of opinion. Gendrin, Mayo, J. W. Earle, and others, affirm that they are, in shape, circular and flattened like those of the blood, but twice as large;—in fact, that they consist of the blood globules, enlarged, and deprived of their colour. Other pathologists, however, amongst whom may be named Abernethy, Raspail, Hodgkin and Lister, Babington and Palmer, deny that the solid particles of pus have the least resemblance to those of the blood; or, in fact, that they possess any definite shape or size

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* Epistaxis, or hæmorrhage from the nose; hæmorrhois, or hæmorrhage from the rectum, and hæmorrhage from the urethra.

whatever. But when we shall consider the formation of this fluid, it will not perhaps be impossible to reconcile these opinions, discordant as they may seem.

CHEMICAL ANALYSIS.—The most recent and important chemical analysis of pus, that by M. Bonnet of Lyons, demonstrates that it contains all the proximate animal constituents of the blood, except the colouring matter. Thus it contains water, soluble albumen, fibrine, aqueous and alcoholic extracts of meat, (or ozmazome,) earthy salts, soluble alkaline salts, (especially the hydrochlorate of ammonia and chloride of sodium,) and fatty matter.* But although, chemically speaking, the elements of blood and of pus are identical, still there is a vast difference in the condition of those elements. Thus the blood contains fibrine;—part of which is solid, and forms the red globules;—part is liquid, constituting in combination with serum the *liquor sanguinis*, and capable of becoming organised when coagulated. Pus also contains fibrine;—part of which consists of enlarged and colourless blood-globules;—part is composed of the liquid fibrine of the blood, which, after having been coagulated, has been broken up into innumerable particles, which are suspended in the serum by the fatty matter, like an emulsion.† But the blood is to all intents and purposes a living fluid;—pus is utterly dead;—the blood conveys to all the frame the influence of life and materials of growth and nutrition;—pus consists, as it were, of the débris of organisation; of materials spoiled by local disease, or wasted in attempts at restoration.

PRODUCTION OF PUS.—It appears from the observations of the most recent pathologists, that pus may be produced in two ways. 1st. By a real process of *secretion*; being elaborated *in* the capillaries, and exuded *from* them. 2ndly, By a process of *disintegration* and *solution* of previously effused lymph, or of coagulated blood, or perhaps of the inflamed textures themselves. ‡

1. The first process, namely that of secretion, is proved to exist by the microscopical observations of Gendrin, who saw the blood-globules in the capillaries, near a sore which he had made in a frog's foot, gradually converted into pus globules, by losing their colour and enlarging in size; and afterwards exuding as pus from the surface of the sore.

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* Resembling that of the brain, and termed *emulsive* by M. Bonnet, because it is suspended in the fluid combined with the minute fibrinous particles, just like the oil and albumen in an almond emulsion. It is the cause of the mawkish sweet taste.

† This statement accords with the observations of Gendrin, Hodgkin and Lister, Babington, Raspail, and Bonnet.

‡ The *first* often called *intravascular*, the *second, extravascular*.

2. The second mode is not admitted by many pathologists. But although the first is the more common, and. most likely always accompanies the second, still it may be seen, from a consideration of the following evidence, that the latter does exist.

Coagulated Blood convertible into Pus.—The conversion of coagulated blood into pus has been proved partly by experiment, and partly by the phenomena of disease. When a blood-vessel is *slightly* inflamed, the blood in it coagulates, adheres to the lining membrane, and becomes organised. If, however, the inflammation be *more severe*, the clot, instead of adhering, will be gradually decolorised, softened, and converted into pus. Gendrin excited inflammation in arteries and veins by injecting irritant fluids into them, and he then confined some blood in the inflamed part by two ligatures;—he confined some blood in part of an artery in the same manner, and then passed a seton through it;—he injected blood into the cellular tissue of a dog;—and the result of all these experiments was the same; the blood coagulated, lost its colour, and softened down into pus. Again in phlebitis, the successive steps of this conversion may be seen in different diseased veins, according to their proximity to the focus of the inflammation. In the more distant the blood will be merely coagulated; in the nearest it will be completely puriform; and in those that are intermediate it will present the various stages of disintegration and softening.

Fibrine convertible into Pus.—The evidence that coagulated fibrine may be converted into pus by disintegration, is founded on the microscopical observations of Gendrin, Babington, and others;—on the phenomena of the formation of abscess in the cellular tissue, which will be presently described;—and on the phenomena of purulent formations in the last stage of pneumonia. But for further information on this subject, the reader must be referred to the works of the before-mentioned pathologists, as the author is unwilling to devote more space to a question that has few immediate bearings on practice.

Tissues convertible into Pus.—Whether tissues are convertible into pus or not, it is at any rate certain that their fragments and débris often form a constituent part of it,

Recapitulation.—It may be observed by way of recapitulation, that the fibrinous particles of pus may consist of enlarged and decoloured blood-globules;—of softened and disintegrated coagulated blood or lymph;—of fibrine effused liquid, but coagulated into irregular particles;—and perhaps of fragments of softened tissues.

SUPPURATION IN THE *Cellular Tissue.*—The successive steps

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* Gendrin, Histoire Anatomique, vol. ii. p. 463, et seq. Basbington in Med. Chir. Trans., vol. xiv. Burrowes in Med. Gaz.

in the formation of pus in this tissue are as follows. First, there will be general softening and effusion of serum;—next, an effusion of fibrine, known by its faculty of coagulating spontaneously;—and this fibrine may be combined with more or less blood;—or pure blood may even be effused with it at the spots where the inflammation is most intense. These effusions increase;—they distend and break down the tissues;—the effused blood and lymph become softened and disintegrated, and they form a fluid;—which at first is thin and reddish, but which soon becomes mixed with colourless blood-globules that escape from the surrounding capillaries in which they have been stagnant,—and thus constitutes pus. The pus is at first dispersed in minute collections; but these soon communicate by the solution of the intervening parts, and form a cavity termed an *abscess*. Meanwhile (in healthy inflammation) the lymph which is effused into the parts around the pus, becomes organised and converted into a *cyst* or *sac*;—which circumscribes the pus already formed, and may secrete fresh quantities of it.

In the Mucous Membrane and Skin.—The mucous membranes, and the cutis deprived of its cuticle, readily produce pus by a process of secretion. They at first exude a thin serous fluid, which gradually becomes thick and opake, till it is perfectly purulent.

Serous Membranes.—The suppuration of serous membranes is preceded by an effusion of serum and lymph; and the pus may be secreted,—either from the surface of that lymph which has become vascular and organised;—or from the surface of the serous membrane itself;—the layer of lymph having been disintegrated and detached.

CAN PUS BE FORMED WITHOUT INFLAMMATION?—This question has been satisfactorily settled in the negative. But although pus cannot be *formed* without inflammation, yet, if it has been taken into the circulation, it may be *deposited* in an uninflamed part. Thus collections of pus are occasionally found in the lungs, liver, brain, joints, or in the cellular tissue of patients who have died with diseases which gave rise to profuse suppuration. These *consecutive abscesses*, as they are termed, are most liable to occur in consequence of phlebitis, because the pus being formed in the veins can find a ready entrance into the circulation; but they may also occur in consequence of small-pox, or after surgical operations which have produced an extensive suppurating surface, and especially if the pus cannot be freely discharged. All these cases are attended with typhoid fever, from the contamination of the blood by the pus. When matter thus absorbed is deposited in any organ, it will of course, by the irritation which it causes, give rise to inflammation and softening, and to fresh purulent formations at the spot.

VARIETIES OF PUS.—There are several varieties of pus, whose characters depend on differences in the part, or in the constitution producing them.

1. *Healthy Pus* (called also *creamy* or *laudable*) is that which has already been described, and is the product of healthy inflammation in healthy parts. It differs from the other varieties in containing the most emulsive fatty matter, which holds the particles of fibrine in perfect suspension, and renders the fluid smooth and of equal consistence. It is produced when inflammation is acute, and when the system is vigorous, and contains a due proportion of fat.

2. *Serous Pus* is thin, almost transparent, and yellowish or reddish. It differs from the last in containing very little fatty matter or fibrine, and in being the product of a low degree of inflammation in weak constitutions.

3. *Clotty or Curdy Pus* resembles the serous, but has numerous white clots and flocculi of coagulated fibrine floating in it. Under the microscope it displays the globules of healthy pus, and numerous other particles of irregular shape. It contains very little fatty matter, so that the fibrine, instead of being equally diffused, concretes into the above-named clots and flocculi. It is commonly found in scrofulous abscesses.

4. *Mucous Pus* (*puriform mucus*, or muco-purulent matter) is ropy and viscid; it may resemble serous pus in colour and transparency, or may be opake. When examined under the microscope, it displays both globular particles, leafy masses, and numerous particles of irregular form. It is secreted by inflamed mucous membranes, and is occasionally found in chronic abscesses. Its viscidity seems to be owing to the presence of a large quantity of hydrochlorate of ammonia,—a salt which abounds in unhealthy pus, and which, if added to the healthy, makes it likewise viscid.†

5. *Concrete or Lardaceous Pus* may either consist of common pus, thickened by the absorption of its watery parts, in consequence of having remained for a long time in a chronic abscess, or bony cavity‡—as the antrum and nasal sinuses:—or it may originally be secreted in a thick condition; and in this latter case differs little or nothing from the melicerous or atheromatous matter found in wens or other encysted tumours.

6. *Putrid Pus* has a fœtid smell, and alkaline reaction, in con-

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* Pearson, Phil. Trans., 1810.

† Mucus gives out more ammonia, when treated by lime or potass, than pus does.

‡ Mayo, Pathol., p. 159.

sequence of the presence of hydrosulphate of ammonia;* which is formed by the decomposition of albumen, when pus is exposed long enough to air and heat.

7. *Specific Pus*, capable of producing the venereal disease or the small-pox, may not differ in its sensible qualities from the healthiest.

Diagnosis of Mucus and Pus.—One subject remains to be noticed, which was formerly deemed of extreme importance; namely, the means by which pus may be distinguished from mucus. It was the opinion of the older surgeons that pus was always produced by a melting down and destruction of the tissues, and that its presence was an unerring sign of the existence of ulcers. They were therefore anxious to discover some test which might enable them to detect it with certainty. Many attempts were made to discover such a test in the effects of various reagents applied to the two fluids. Thus we are told by certain chemists that dilute sulphuric acid dissolves mucus, but not pus;—that the strong sulphuric acid dissolves them both, but that on the addition of water pus is precipitated, whilst mucus remains in solution; and many other tests of the same nature have been proposed, and each for a time has been reputed infallible.

But the discordance of the results produced by the same reagent in the hands of different experimenters may well suggest doubts as to the possibility of ever arriving at a certain criterion by such means. Andral, for instance, was so far from finding sulphuric acid a discriminating test for pus and mucus, that when he added it to *six different fluids*;—namely, softened tubercle;—creamy pus from a phthisical abscess in the lung:—pus from an abscess in the pleura;—the sputa of a consumptive patient:—the sputa of a patient with chronic bronchitis;—and mucus from the nostrils and pharynx, he found that it acted on all of them alike, that they all were dissolved by it, and all without distinction were precipitated by adding water. And every other chemical reagent has proved equally unsatisfactory and delusive.

The real cause, however, of these discrepancies, which was long ago pointed out by our countryman Dr. G. Pearson, has been established with the utmost clearness and certainty by the recent researches of M. Bonnet. It is proved that the difference between these two fluids is one of degree, and not of kind;—that their essential constituents are the same;—and that mucus may be converted into pus merely by an increase of its fatty matter and fibrinous particles, of which it naturally contains but little.

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* Formerly called hydrosulphuret of ammonia, or hepatised ammonia; hydrosulphuric acid being the modern term for sulphuretted hydrogen. Albumen contains sulphur, hydrogen, and nitrogen;—all the elements of this salt.

Healthy mucus appears under the microscope to be composed of large semi-transparent globular masses, with a very few small spherical particles. The *thin serous exudation* which is the first product of an inflamed mucous membrane, displays a few spherical globules; and, on standing for some time, becomes more opake, and has a few fibrous, leaflike, and curdy masses formed in it. *Ropy mucus*, the next degree of deviation from the healthy standard, has in addition crowds of spherical particles, not unlike those of the blood, but larger. *Puriform mucus*, which has already been described, is the next degree; and, by a continuance of inflammation, the secretions may gradually assume the characters of pure pus. And thus, although the distinction between perfect mucus and perfect pus is sufficiently marked and obvious, there are innumerable intermediate grades in which any such distinction would be impossible.

Although, however, it need scarcely be said that the presence of pus in the secretions of a mucous membrane is no unerring sign of ulceration, it still is an important circumstance by which to judge of the degree, nature, probable duration, and ultimate event of the malady. The best method by which pus may be detected is that proposed by Dr. Young; which is performed by placing some of the suspected fluid between two pieces of plate glass, and looking through them at a candle, some dark body being in the background. If pus is present, the candle will be seen surrounded by coloured rings, owing to the refraction of the light by the globules; but if it be merely mucus, the light will pass undisturbed. A test proposed by Hippocrates is not without some value; it consists in throwing the fluid on burning coals; when pus exhales a fœtid odour, and mucus none;—depending of course on the greater quantity of fibrine contained in the former.

SECTION II.—OF ACUTE ABSCESS.

DEFINITION.—An *abscess* may be defined to be a collection of pus in the substance of any part, or in any cavity. There are three kinds; 1. The *acute or phlegmonous*; 2. The *chronic* or *cold*; 3. The *diffused*.

SYMPTOMS.—Acute abscess (which, when occurring in the subcutaneous cellular tissue, is called *phlegmon*) commences with all the ordinary signs of acute inflammation. There is inflammatory fever;—severe throbbing pain, bright redness, and much swelling;—firm in the centre, and œdematous around. The occurrence of suppuration is indicated by severe rigors, by an abatement of the fever, and a change in the pain,—which becomes a sense of weight and tension, with a pulsatory feel at each beat of the arteries. Then the tumour becomes softer, and loses its bright arterial colour; and as the quantity of matter increases, its centre begins

to *point*, that is, to project in a pyramidal form, and *fluctuation* can be felt by alternate pressure with the fingers.

PATHOLOGY.—The successive steps in the formation of this abscess have already been described. Suffice it to say, that the matter is circumscribed by a cyst, formed of coagulable lymph, of a thickness proportioned to the intensity and duration of the inflammation, and lined with a greyish, unorganised pellicle.

PROGRESS.—The pus having been formed, the next step is its evacuation, which is effected either by what Hunter called *progressive absorption*;—that is, the successive absorption of all the parts intervening between the abscess and the surface;—or just as probably by their successive softening and disintegration. Be this however as it may, the tumour becomes more and more prominent and soft; the surrounding inflammation and tumefaction subside; the centre becomes of a dusky red or bluish tint, the cutis is removed, the cuticle bursts, and the pus escapes.

Although abscesses may burst into serous cavities, or mucous canals if they happen to be near, still their general course is that which is least prejudicial;—namely, towards the skin. The cause of this happy provision has much engaged the attention of pathologists. It has been partially explained by supposing that in proportion as the quantity of pus increases, it advances towards the skin, because in that direction it is opposed by the least pressure. But in many instances where the pressure on both sides is equal, as in abscesses of the alveoli of the teeth, and fistula lachrymalis, the matter tends to the outer side notwithstanding. Hunter said that inflammation is always more violent on the side nearest the skin;—and that superficial parts are more disposed to suppuration than the deep-seated. But these are mere enunciations of a fact, of which, as of the upward growth of a plant, we can appreciate the advantage better than we can assign the cause.

GRANULATION.—The matter having been discharged, the cavity of the abscess contracts, the pellicle of lymph which lines it is cast off, and its surface becomes covered with numerous, small, red, vascular eminences called *granulations*. These are formed by the effusion of lymph in successive layers;—each of which soon becomes vascular and organised, and secretes pus. The reason why the lymph is effused in the form of these little eminences is supposed to be, that each of them is formed by one minute artery, which runs through its centre, and then divides into numberless ramifications on its surface. So that if the restorative actions be vigorous, and blood-vessels numerous, the granulations will also be numerous; but small and florid;—whilst in the opposite state they will be large, pale, and flabby. And the pus from healthy granulations will be laudable and creamy,—from the other, thin and flaky.*

* Granulations are often extremely sensible, and of course supplied with nerves; perhaps also with absorbents.

CICATRISATION.—When the cavity has become filled up by the growth and union of granulations, the red inflamed skin around its orifice is removed by ulceration, so that the margin of the sore becomes adherent and fixed;—and then *cicatrisation* begins. A white pellicle extends from the circumference, gradually covers the whole surface, and becomes organised into a new cutis and cuticle, called a *cicatrix*. This cicatrix is at first thin and red, but soon becomes denser and paler than the original skin, and, like all new textures, is less vascular and less vital. The colouring matter between the cutis and cuticle is later in appearing. But this process is accompanied by two others, namely the contraction of the surrounding skin, so that the surface to be healed is very much diminished before cicatrisation commences, and the contraction of the cicatrix subsequently. The preliminary contraction of the skin appears intended to diminish the labour of an extensive reparation;—the subsequent contraction of the cicatrix is in conformity with a law mentioned in the Chapter on Adhesion, and depends on the absorption of the newly-formed subcutaneous cellular tissue. It is always greater where the preceding granulations have been pale, flabby, and exuberant, as in burns.

CAUSES.—Acute abscess is mostly *idiopathic*, that is, depends on constitutional causes;—it may, however, be caused by blows, ecchymoses, or by foreign bodies introduced into the skin or flesh.

TREATMENT.—The *indications*, in the first stage, are, to procure resolution of the inflammation, and prevent the formation of matter. After it has formed, the indications are, to cause its evacuation, and induce granulation and cicatrisation.

In the *first stage*, therefore, the patient should be purged, or perhaps bled, his diet should be low, and leeches should be applied to the part. But when the cold applications feel chilly and uncomfortable, (as they will when suppuration begins,) they should be exchanged for warm poultices;—and when fever abates, the diet should be increased.

Poultices are admirable remedies;—they relax the skin, promote perspiration, soothe pain, encourage the formation of pus, and expedite its progress to the surface. They should be large,—so as not soon to become cold or dry; they should be soft, that they may not irritate,—and light, that they may not fatigue. They may be made of bread and water, or of oatmeal boiled till it is soft, or of linseed meal. Mr. Liston, who considers the very word poultice as synonymous with filth and stench, uses the *water dressing* instead,—that is, a piece of soft lint or folded linen, dipped in warm water, and covered with oil silk, to prevent evaporation; but this is a very inadequate substitute for the luxurious softness of a well-made poultice.

If, after the formation of matter, the inflammation does not subside, but swelling, hardness, and pain remain, then the application of leeches may be repeated; but in other cases the con-

tinuance of depleting measures after matter has formed, or when its formation is inevitable, will only weaken the patient, and delay the cure.

Respecting the *opening of abscesses*, it may be laid down as a general rule, that if they point and become pyramidal, without enlarging in circumference, they may be left to burst of themselves; but that if they enlarge in breadth and circumference, without tending to the surface, they should be opened. In the following eight cases, however, the surgeon's aid is imperatively demanded.

1. Where matter forms beneath fasciæ and other dense ligamentous textures, such as the sheaths of tendons, &c. Because, as these are absorbed or softened with the utmost difficulty, the pus, instead of coming to the surface, will burrow amongst muscles and tendons, extending the abscess to great distances;—producing extreme pain and constitutional disturbance, by its tension of the fasciæ which cover it, and pressure on the parts beneath,—endangering extensive sloughing, and impairing the future motions of the part. Hence, as a general rule, all abscesses beneath fasciæ, or among tendons, (as in the hand, foot, &c.,) should be freely opened, as soon as the existence of matter is suspected.

2. Where the abscess is covered by a thick layer of fat; this tissue being indolent, and not readily absorbed.

3. Where matter forms near a bone, whether under or over the periosteum, lest exfoliation or necrosis ensue from the contiguous irritation.

4. Where the abscess is formed in loose cellular tissue, (as around the anus,) which would readily admit of great distension and enlargement of the sac, especially if (as in the axilla) the cellular tissue be partially covered with muscles, under which the matter might burrow.

5. Where abscess is caused by the extravasation of urine, or other irritant fluids.

6. In suppuration of very sensitive organs, as the eye or testis.

7. In suppuration near a joint or great serous cavity, or the trachea, lest the abscess burst into them, which might be fatal.

8. When it is desirable to avoid the scar which always will ensue when an abscess ulcerates spontaneously.

And in the first five of these cases it is much better to make an opening unnecessarily, than to delay it for one moment after matter has formed.

The best *instrument for puncturing abscesses* is a straight-pointed, double-edged bistoury. It should be plunged in at right angles to the surface, till it has entered the cavity, which may be known by a diminution of the feeling of resistance, or by slightly withdrawing the instrument, so that a drop of pus may exude by its side. Then the aperture may be enlarged sufficiently as the instrument is being withdrawn. A trocar may be used if the

pus is covered by several loose unconnected layers of fasciæ. The puncture should be made at the most depending part of the abscess; and if it seems likely to close, its edges may be separated for the first forty-eight hours by a piece of oiled lint, formerly called a *tent*. After the opening, no rude attempts should be made to squeeze out the matter, as they might induce inflammation; but it should be allowed gradually to exude into a poultice or fomentation, which may be changed as often as necessary.

The poultices may be continued till all pain has subsided, and the cavity has begun to granulate;—but not too long, lest the granulations become weak and flabby. And then the ulcer which remains must be treated in the manner prescribed in the chapter on that subject. Too hasty an approximation of the parietes may cause the formation of fistulæ, and must be avoided.

The *diet*, which must be low during the inflammatory stage, should be improved when suppuration commences,—and should afterwards be so regulated as to maintain the strength. It should be combined with tonics, and change of air if necessary;—in order to prevent the accession of hectic, or exhaustion from profuse and long-continued suppuration.

In a few cases, acute abscesses (especially in glandular textures and venereal cases) may be cured by the absorption of their pus, and consequent obliteration of their cavity. The means best adapted to promote this are leeches and cold, with purgatives and remedies adapted to increase the secretions generally,—and above all things a sea voyage, so as to cause considerable sickness.

SECTION II.—CHRONIC ABSCESS.

General Description.—Chronic abscess is the result of a low degree of inflammation; so slight indeed, that its existence is often unsuspected for a long time. These abscesses are mostly lined with a thin, reddish grey, distinctly-organised cyst;—there is little or no vascularity in the parts adjoining;—and the pus is *serous* or *curdy*;—but sometimes the cyst is thick, and cellulo-fibrous, and the matter *concrete*, so as hardly to differ from an encysted tumour. Chronic abscesses are often deep-seated, whilst the acute are mostly superficial.

Causes.—The causes are a weakened and scrofulous habit, chronic disease of bone, or other source of slow irritation.

Symptoms.—When first detected, a chronic abscess appears as an obscure tumour, with a fluctuation more or less distinct according to its distance from the surface;—it is free from pain, tenderness, swelling, or redness, unless far advanced, or accidentally inflamed.

Progress.—These abscesses may attain an enormous magnitude, partly because the sac being thin is readily extensible,—and partly

because of the atonic and indolent grade of the inflammation, which is insufficient to implicate the adjoining textures, and make the coverings ulcerate. When, however, from the increasing distension, or from some accidental irritation, this does happen, the skin reddens, inflames, and ulcerates, and so the matter is discharged.

TERMINATIONS.—(1.) In slight cases the stimulus of the air causes the interior of the sac to pour out granulations;—the reddened skin around the orifice is absorbed;—and the sore so formed may heal. (2.) If the restorative powers are weak, and the parietes of the sac have been unequally pressed together, one or more *sinuses* may remain. (3.) If, on the other hand, the abscess be very large, or if it be connected with a permanent cause of irritation, (as diseased vertebræ,) or if, after the admission of air, the pus have not a free exit, a most serious train of consequences will ensue. The pus, exposed to the atmosphere, putrefies;—the hydrosulphate of ammonia (the product of putrefaction) is absorbed into the blood;*—the interior of the sac inflames, partly from the irritation of the air, but chiefly from that of the putrid pus;—and then the grave and irreparable local disease, together with the contamination of the blood, induces typhoid fever, under which the patient sinks.

PROGNOSIS.—Hence the danger of these abscesses will be great; (1.) If they are connected with a source of permanent irritation, which, by continuing the production of matter, prevents the sac from closing. (2.) If the sac has attained a large size;—and (3.) If under these circumstances it has advanced so far towards ulceration, that a spontaneous and permanent aperture is inevitable.

TREATMENT.—There are three *indications;* (1.) To amend the general health, and remove all causes; (2.) To procure absorption of the matter; (3.) If that be impracticable, to open the abscess with such precautions as may induce a speedy contraction and obliteration of the sac.

(1.) To fulfil the first indication, the general principles laid down under the head of Chronic Inflammation must be acted upon. The necessity of wholesome and sufficient food, pure air, warm clothing, and freedom from avocations that fatigue the body or harass the mind, need scarcely be adverted to; whilst the appetite and digestion must be improved by tonics, and the secretions of the skin, liver, and bowels, be carefully maintained. The preparations of iron and bark, iodine, the iodide of iron, with occasional mild mercurials, FF. 7, 11, if the stools are deficient in bile, and laxa-

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* It may be detected in the blood and urine. The blood in these cases is black, and refuses to coagulate;—which is precisely the effect produced by adding the hydrosulphate of ammonia to healthy blood. Vide M. Bonnet's papers in the Med. Gaz.

tives, F. 8, are the most useful measures. If (as in the case of psoas and lumbar abscess) the abscess has been caused by some local disease, the latter must if possible be ascertained, and removed by proper measures.

(2.) The best means for causing absorption of the matter are the various general remedies which have been just enumerated, but it may be hastened by local stimulants or counter-irritants applied to the tumour or its vicinity. Plasters of Empl. Galbani c., or Emp. Thuris c., or Emp. Hydrargyri, or Emp. Ammoniaci cum Hydrarg.; or an issue, or blister kept open; or a succession of blisters, when one is nearly healed, another being placed beside it; or friction with Ung. Iodin.; electric sparks; and cold affusion, are the most useful remedies; but they do harm if they cause heat or pain. Leeches, cold lotions, and purgatives must be employed if the tumour should inflame from any constitutional or local cause of irritation.

(3.) But if, notwithstanding these efforts, the tumour continues to enlarge, it cannot be opened too soon;—especially if there be any incipient redness of the skin. And a different proceeding is requisite in different cases.

If the abscess is superficial and small, without a hardened base, and freely fluctuating, an acupuncture needle or grooved needle may be passed into it twice or three times a week, so as to cause a little matter to exude;—moderate pressure being used at the same time by means of a compress and bandage wetted with cold lotion. If this does not shortly succeed, and the abscess is small, a pretty free aperture may be made into its most depending part, so as to empty it completely. It is a great object to evacuate all flakes of unhealthy lymph, which if retained would be sure to prevent adhesion, and cause an open sore to be formed; but no violent pressure or squeezing must be employed. After the opening the patient should observe quietude, and a bandage, or adhesive plaster and compresses, should be passed round the part, so as to keep the sides of the sac in apposition with a moderate degree of pressure; and thus a free exit being provided for the pus, the opposing surfaces will often granulate and adhere;—the external aperture heals, and the case is cured. If from deficiency of action this adhesion will not take place, weak stimulating injections may be used (such as Zinc. Sulph. gr. j ad Aquæ ℥i.) Or another aperture may be made, and a seton be passed through the sac;—or if it be long and fistulous, it may be slit up, and made to heal from the bottom.

If the abscess be seated in the neck or other exposed part of a female, it is of the greatest consequence to her future happiness and prospects that an early opening be made, so that all scars and deformities may be avoided. The instrument recommended by Sir A. Cooper for this purpose is a very fine lancet, only one-eighth of an inch broad; the puncture should be large enough to extract

all flakes, but no larger; and it should be made transversely, so that its minute cicatrix may be hidden by the folds of the neck. Adhesive plaster should then be applied with moderate pressure;—and weak injections may be used, if the sac does not become obliterated in the course of a few days.

In some cases, when a considerable portion of skin has become thin and red—evincing that it will certainly ulcerate and form a large aperture, it will be advisable to apply the caustic potass, so as to destroy the diseased portion of skin, and avoid the more painful and tedious process of ulceration.

Large Chronic Abscesses.—If the abscess be so large that the exposure of its cavity would lead to the evil consequences that have been enumerated;—or if it be connected with disease of the spine, or other bone, (as in the case of psoas abscess,) the following plan should be resorted to, with the view of inducing a contraction of the sac, and of diminishing the danger from a permanent opening, should one be established subsequently. A *small puncture* should be made with a lancet at the most depending part of the tumour. It may be made *valvular*, by drawing the skin a little to one side before introducing the instrument, but this is not of much consequence. As much matter as flows spontaneously should be permitted to escape, and then the puncture should be carefully closed by lint and plaster, and the patient be kept at rest till it is healed. During the flow of the matter, the greatest care ought to be taken to prevent the admission of air into the sac. At the expiration of ten days or a fortnight, when it is nearly refilled, a second puncture should be made (but not too near to the former) and should be healed again in like manner. This operation should be repeated at proper intervals, taking care never to let the abscess become so distended as it was before the previous puncture,—and using *moderate* support by bandages in the intervals. Thus, in fortunate cases, these repeated partial evacuations, combined with proper constitutional measures, will cause the abscess gradually to contract;—so that it either becomes completely obliterated, or degenerates into an insignificant fistula.

The credit of discovering this method of treament is due to the late Mr. Abernethy. He, however, recommended *as much as possible* of the matter to be evacuated at each operation, instead of allowing it to run spontaneously;—which latter method is much better calculated to preclude the admission of air, and avoids all irritation of the cyst by rough handling or squeezing.

But if this process has been delayed too long, and a spontaneous aperture has formed;—or if one of the punctures have not healed;—or if air have gained admission into the cavity, so that the pus has become putrid, and the horrible consequences of its absorption have begun to appear;—then the indications plainly are, to make free openings and counter-openings, so as to prevent all lodgment of the putrid pus;—and to wash only the sac occasionally with

injections of warm water, to which perhaps a little of the chlorides of soda or lime might be added with advantage. At the same time the general treatment of typhoid fever must be adopted, and the strength be supported, in order that the absorption of noxious matter may be prevented, and its elimination be facilitated. The sedulous administration of wine, nourishment, opium, quinine, camphor, &c., as in Formulæ 1, 2, 3, may in fortunate cases enable a patient to recover, and at all events will retard his passage to the tomb.

M. Bonnet has suggested an expedient in these cases, that might often be worth the trouble of adopting. He proposes to immerse under water the part in which the abscess is situated, at the time it is punctured. This would, of course, render the egress of air impossible;—an occurrence which, in the ordinary way of operating, will often happen in spite of every precaution.

SECTION III.—DIFFUSED ABSCESS, OR DIFFUSE INFLAMMATION OF THE CELLULAR TISSUE.

General Description.—This is an inflammation, characterised by an absence of the disposition or of the power to form healthy adhesive lymph. It consequently spreads rapidly and widely, and is attended with constitutional symptoms of the gravest character.

Symptoms.—An extensive and rapidly increasing swelling appears on one of the limbs, or on some part of the trunk. Its surface is tense, shining, and usually pale. When pressed upon, it feels in some cases hard and resisting, but more frequently, it yields that peculiar, semi-elastic sensation described by the terms *boggy*, or *quaggy*. There is always most excruciating pain;—which in some cases is burning and throbbing, in others, heavy and tensive. The disease is invariably attended with fever of an irritative or typhoid character. The pulse is always frequent;—it may be sharp and jerking, but is without strength and steadiness. The countenance is anxious and haggard;—the mind irritable and desponding, and delirious at intervals. Respiration is quick and laborious,—more especially if the disease be seated on the chest, as it frequently is;—because the pleura is affected through contiguous sympathy. In unfavourable cases, low muttering delirium, subsultus tendinum, copious offensive perspiration, and jaundiced skin, usher in the fatal termination.

Causes.—The *predisposing* causes of this disease comprise all the agents capable of lowering the vital energies. Unwholesome food; confined air; disorder of the secretions of the alimentary canal and its attendant glands; exhaustion of the mind from excessive study;—the depressing passions;—and certain epidemic noxious states of air;—to which last must be attributed the extraordinary prevalence of this disease in the Plymouth dockyards in the year 1824.

The *exciting causes* may be of the most trivial nature, if the patient be predisposed; such as very slight punctures or abrasions. This is the disease which is excited by the bites of venomous serpents;—and by inoculation with septic animal poisons;—especially by that which is generated in bodies recently dead;—it also occasionally follows certain surgical operations, as lithotomy and venæsection.

Morbid Anatomy.—On examination of the parts affected, (at an early period of the disease,) the cellular tissue is found loaded with a limpid reddish serum. In a more advanced stage, this fluid becomes thicker, and less highly coloured. Subsequently, the cellular tissue is found to be gorged, partly with white semi-fluid matter, partly with a brownish purulent sanies, which is mingled with detached flakes of the sphacelated tissue. The muscles, and other structures in the vicinity, are discoloured and softened;—and the larger veins which permeate the diseased part, have their coats inflamed, and often in a state of suppuration.

Diagnosis.—This disease is to be distinguished from the common phlegmonous abscess, by its having a smooth and level surface, without any tendency to point;—also by the asthenic nature of the accompanying fever. It presents many points of resemblance to *phlegmonous erysipelas*;—and, in fact, is not unfrequently combined with it;—but it is to be distinguished from it by the circumstance, that in phlegmonous erysipelas the skin is inflamed from the first;—whereas in diffuse cellular inflammation it is only affected secondarily, and after the disease has lasted for some days.

Treatment.—This will be more fully discussed in the Chapter on Dissection Wounds, (Part iii. ch. 9.) It may, however, be summarily observed, that leeches, hot fomentations, and free incisions;—emetics, purgatives, and enemata, followed by ammonia, bark, opium, and wine, are the measures that are sanctioned by the most authoritative and experienced writers.*

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* Vide two papers in the Edinburgh Medical and Surgical Journal for 1825, vol. xxv. Copland's Dict., Art. Cellular Tissue. James on Inflammation. Travers on Constitutional Irritation. Butter on Irritative Fever, (a book that every one ought to read,) and the authorities that will be quoted in the ninth chapter of the third part of the present work.

CHAPTER VIII.

OF ULCERATION.

SECTION I.—OF THE PATHOLOGY OF ULCERATION.

DEFINITION.—Ulceration may be defined to be the production or extension of a sore on the surface of any part.

SYMPTOMS.—Ulcerative inflammation is attended with more or less of heat, redness, and swelling; and with pain of a severe and peculiar character, which is compared by the patient to the gnawing of an animal. If the part affected be skin, and there have been no previous breach of surface, the ulcer first appears as a pustule, being covered by the cuticle;—and when the cuticle is broken, it displays an irregular hollow, lined with a whitish tenacious matter; and studded with red eminences, that bleed easily if roughly handled. It discharges a thin serous matter; its edges are ragged, loose and undermined; and the surrounding skin is red and tumefied.

PREDISPOSING CAUSES.—The *Tissues* most disposed to ulceration are the natural surfaces, namely, the skin, and mucous or synovial membranes. From these it may spread to other subjacent tissues, which yield to it with varying degrees of rapidity. The cellular tissue very easily ulcerates; but muscles, blood-vessels, and nerves very slowly; so that they often appear to be as it were dissected out in spreading sores, by the destruction of the cellular tissue around them. Tendons and ligaments are also very slow to ulcerate, but cartilage, bone, and the cornea, are in certain constitutions extremely liable to it.

The *Constitutions* most liable to ulcerations, are those which are debilitated by intemperance or privations;—and those which are tainted with syphilis or scrofula;—or broken down by the excessive use of mercury.

The *parts* most disposed to it are those whose circulation is most weak and languid; such as the lower extremities;—and more especially if the return of their venous blood be in any way impeded by a varicose state of the veins. On this account tall persons are much more frequently affected with ulcers of the legs than the short. Sir E. Home shows, on the authority of Dr. Young, that twenty-two out of one hundred and forty-five tall men, and only twenty-three out of two hundred and seventy-six short men were discharged from a regiment in the West Indies in four years, on account of ulcers.

Parts newly formed (as cicatrices) are also, as has been before said, more liable to ulcerate than those of original formation. Hence ulceration is so liable to attack morbid growths of all descriptions;—whether they have been produced (1) in conse-

quence of injury, as cicatrices and callus; or (2) whether they are developed from hypertrophy of a standard structure;—as cutaneous tumours, which often remain stationary for years, and then, from some slight irritation, will give rise to the most destructive and spreading ulceration; or (3) whether they consist in the deposit of a texture alien to the normal organisation;—thus cancerous diseases appear to depend mainly on the deposit of a new texture, which, from its low powers of vitality, yields after a time to disorganisation.

EXCITING CAUSES.—In constitutions or parts predisposed to it, the slightest irritation may be sufficient to excite ulceration. But in the healthy it can only be produced by the continuous application of some irritant, so as gradually to exhaust the vital powers of the part;—continued pressure, the passage of irritating fluids;—or long irritation from depraved secretions in consequence of filth, are the most frequent causes;—but it is not easy to excite genuine spreading ulcerative inflammation in the healthy, unless by some specific cause, such as the venereal poison.

PATHOLOGY.—The majority of modern pathologists, following the doctrines of Hunter, maintain that ulcers are formed by that variety of absorption which he has denominated ulcerative;—that is to say, that the deficient molecules are removed by a self-absorption. But before an unqualified assent can be given to this proposition, three questions must be discussed—viz. 1st. Is it proved that ulcers are formed by absorption at all? 2ndly, If they are, is it by a self-absorption of the part which ulcerates? 3rdly. If formed by absorption, is it through the operation of the lymphatics or of the veins?

1. It certainly seems to be *possible* that ulcers may be originally formed and subsequently extended by a genuine process of self-absorption; but it is in vain that we look for any experimental proof, or for any other kind of proof of this doctrine, in Hunter's works or elsewhere. Hunter merely states that it is so;—and that he was the first to point it out; but he nowhere attempts to prove it.

2. Regarding the second question, whether a part absorbs itself, (supposing ulcers to be formed by absorption at all,) it can only be said that it is just possible that it may, although there is no proof extant that it ever does. On the other hand, Mr. Key has very satisfactorily proved, that in some varieties of ulceration of cartilage, an absorption is produced by the synovial membrane, or by an organised false membrane, and not by the cartilage itself.

3. As to the third question, viz. whether absorption, when it occurs, is performed by the lymphatics* or veins, our remarks must

* Some evidence in favour of the lymphatics is afforded by a preparation in the Hunterian Museum, (Catalogue, vol. ii. p. 19,

be brief. The best evidence in favour of the former is the fact that the lymphatic vessels and glands leading from a syphilitic or other cachectic ulcer are frequently inflamed. But in opposition to this it may be urged that bubo is most common, not whilst venereal sores are spreading, but when they are healing;—and that its occurrence is more easily explained by the supposition of *continuous irritation* than by that of absorption. For if bubo arose from the transmission of poisonous fluids, it is difficult to conceive why it should not be constant instead of occasional. On the other hand, the theory that the veins are the agents in this process is supported, 1st, by the observations of Kaltenbrunner and Wedemeyer, who saw, by means of the microscope, particles of an inflamed tissue detach themselves from its substance, and mix in the current of blood which circulated in the capillaries; 2ndly, by the circumstance that the veins near ulcers are more frequently found filled with pus than the absorbents; 3rdly, because absorption from mucous or other surfaces is always diminished during inflammation;—so that a quantity of extract of nux vomica, which would prove fatal if applied to a healthy mucous membrane, or if introduced into a recent wound, may be applied with impunity if those parts are inflamed; 4thly, Mr. Key caused suppurating sores to be formed on the insides of the thighs of a young ass;—some ferrocyanide of potassium was inserted into them six hours before the animal was killed. A portion of blood was taken after death from the iliac and mesenteric veins, and some lymph from the thoracic duct, and they were analysed by Mr. Alfred Taylor. The blood from the iliac veins contained the salt in large quantity;—the lymph from the thoracic duct contained only $\frac{1}{50}$th as much; and the blood from the mensenteric veins displayed none at all. And these experiments show that as the absorption of fluids *from* the surface of a healthy sore is effected rather by the veins than by the lymphatics, so the removal *of* the surface itself (if effected by absorption at all) is most probably performed by the veins likewise.

From these arguments it may be concluded;—that it is by no means proved that ulceration is effected by the agency of absorption. On the contrary, it is much more probable that it depends on a

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prep. 862,) described as "a portion of a plexus of absorbent vessels from the head of a spermaceti whale, filled with spermaceti, which was by their action in process of removal. This valuable preparation affords a strong argument in favour of the doctrine that the wasted and superfluous parts are removed by the absorbents, and not by the veins." But by comparing certain passages in Hunter's works, it will appear that he was by no means certain that these were lymphatics.—Vide Catalogue, vol. iii. pp. 215 and 223; and Essay on Whales, p. 390, in the Animal Economy.

far different process, which in modern times has been principally advocated by Mr. J. W. Earle and Mr. Key.

REAL MECHANISM OF ULCERATION.—According to these gentlemen, it consists in the softening, mortification, and disintegration of successive layers of minute irregular fragments. These for a time adhere to the sore, causing the foul, greyish, spongy surface of spreading ulcers, and then come away mixed with the discharge. This destructive process may occur without inflammation; being followed by it, in order to repair the chasm;—or it may be a direct effect of inflammation; the ulcerating part first inflaming, and then softening down into pus, together with the lymph that has been deposited in its interstices. Thus it evidently appears, that the formation and spread of an ulcer on the surface of a part, and of an abscess in its substance, are identical in their nature and mechanism, and differ merely in their situation.

SECTION II.—OF THE VARIETIES OF ULCERS.

I. The *healthy ulcer* is nothing more than a healthy granulating and cicatrising surface; the granulations are small, numerous, florid, and pointed, and yield a moderate secretion of healthy pus. The edges are smooth, and covered with a white semi-transparent pellicle, which is gradually lost on the margin of the granulations. It will be recollected that a healthy sore of this description will be greatly diminished by the contraction of the surrounding skin, before any cicatrisation has actually occurred.

TREATMENT.—The only treatment required will be a little dry lint, if there be much discharge,—or the water-dressing, or simple ointment, if there be not. If there be not much discharge, the dressings should not be changed more frequently than every second or third day. If the granulations are too luxuriant, they may be touched with lunar caustic. and dressed with dry lint;—or the sore may be exposed to the air for some hours. If the granulating surface is very extensive, or if all applications disagree with it, as sometimes happens, it will be expedient to form a *scab* on its surface. This may be done by allowing the pus to dry, or by sprinkling a little flour, or calamine, or chalk, to absorb it. But the best plan in these cases is to pass a stick of lunar caustic over the surface of the sore, as recommended by Mr. Higginbottom. This salt instantly coagulates the fluids on the sore, and forms a white pellicle, which soon becomes dry and black, and is much less irritating than an ordinary scab. If the scab act favourably, suppuration ceases, and cicatrisation will be found complete when it is detached. No other dressing is required, except, perhaps, a piece of goldbeaters' skin, or a slight fillet, to prevent injury. If pus continue to be formed, a small hole should be made in the middle of the scab to let it out.

II. The *inflamed ulcer* has a white or greyish surface, eaten into

irregular hollows, with intervening red eminences which easily bleed. The discharge is thin and sanious,—the edges ragged, the surrounding skin red and swollen, and the pain severe and gnawing. An ulcer having these characters may be considered as extending itself.

CAUSES.—Ulcers are liable to inflame from any of the ordinary local or constitutional causes of inflammation, especially excess in diet. Sores situated over projecting parts of bones or ligaments, as the outer ankle, or over the bellies of muscles, are apt to assume this character; hence care should be taken to avoid making issues in such situations.

TREATMENT.—In a few instances, when the patient is very plethoric and strong, it may be expedient to bleed, and to administer calomel and opium till the mouth is slightly affected. At all events the bowels should be cleared by calomel and senna; the secretions must be kept up by Plummer's pill, or F. 7, and the diet be regulated. The patient should keep at rest, with the affected member in an elevated posture. Leeches may be applied in the vicinity of the sore; but not too near it, and not to any place where the skin is much thickened and congested, lest the leech-bites themselves take on ulceration. The part should be fomented night and morning for half an hour with poppy fomentations, and should then be poulticed;—and if the pain be very severe, the poultice may be medicated with opium or conium. If the ulcer diminish under these applications, but yet its surface remain foul, they may be continued till it is healed; but if the surface becomes healthy, it may be treated as an ordinary healthy ulcer.

If warm applications aggravate the pain, cold, evaporating, or saturnine lotions (F. 11) should be used, the sore being protected by a piece of simple dressing. If all these soothing measures prove ineffectual, the action of the parts must be altered by stimulants, such as very weak nitric acid lotion, (F. 17,) or weak solution of nitrate of silver, or liq. arsenicalis, diluted with two parts of water. Very finely powdered charcoal mixed with cream, or gentle pressure with strips of soap plaster, may also be tried;—but it must be recollected that all remedies lose their good effects in time, and consequently that they should be changed before they begin to disagree.

III. The *irritable ulcer* is a variety of the inflamed. It is defined by Mr. Skey* as having an excess of *organising action*, with a deficiency of *organisable material*; so that the granulations are too small, and are morbidly sensitive and vascular.

Treatment is to be conducted on the same principles as in the last case. Soothing applications are to be first tried;—and if they

* F. C. Skey, F.R.S. A new mode of treatment employed in the cure of various forms of ulcer. London, 1837.

fail, stimulants. At the same time, medicines should be given to maintain the secretions, and allay morbid irritability: Plummer's Pill, or F. 7, at night; and sarsaparilla, with sesquicarbonate of soda and tincture of hyoscyamus, during the day. The extract of conium, taken internally in doses of gr. v. bis die, and applied to the sore in the form of lotion, is often of great use.

IV. The *weak ulcer* is the direct reverse of the preceding. Its powers of organisation are deficient. The granulations are large, pale, flabby, and insensible, rising above the margin of the skin, and showing no disposition to cicatrise.

Causes.—This state of the ulcer may be owing to debility of the system; but the healthiest granulations, if their healing be delayed, become weak;—and conversely, if any granulations do not cicatrise, they should be considered as weak, and treated accordingly.

Treatment.—The indications are to augment the vital forces of the granulations, and to restrain their exuberant growth. The diet should be liberal, and should include a moderate quantity of wine, (or still better of beer.) If there be much debility, some preparation of bark or steel should be exhibited. If the granulations are extremely exuberant, they may be destroyed by escharotics, such as cupri sulphas;—or sometimes may be shaved off with a thin knife;—but it is better to cause their removal by overstimulation than by actual destruction. So that the best applications are, fine dry lint, which by itself is an excellent stimulant, or lint dipped in a lotion of sulphate of zinc, or of sulphate of copper, or of nitrate of silver;—or in the black wash. The formation of a crust or scab with the lunar caustic, on Mr. Higginbottom's plan, may often be resorted to with advantage. At the same time, pressure, by means of strips of plaster, or compress, and bandages, are necessary to prevent languor of the circulation;—especially if the muscles are wasted and flabby. In some cases a scab may be formed by covering the sore with powdered rhuharb, taking care to oil the edges, so that they may not be irritated by it. If the patient be young and weakly, with great coldness and blueness, and tendency to œdema in the extremities, the limb may be immersed in tepid salt water for fifteen minutes twice a day: to which an equal part of decoction of poppies may be added if pimples are produced.

V. The *indolent ulcer* is characterised by deficiency of *action* as well as of *power*. Its surface is smooth and glassy, and of a pale ashy colour, like a mucous membrane. Sometimes, however, it displays a crop of weak fungous granulations. The edges are raised, thick, white, and insensible; the discharge scanty and thin. The most frequent *situation* of these ulcers is the small of the leg, and they are almost exclusively met with amongst the lower orders. They are often stationary for a great length of time; but, from any

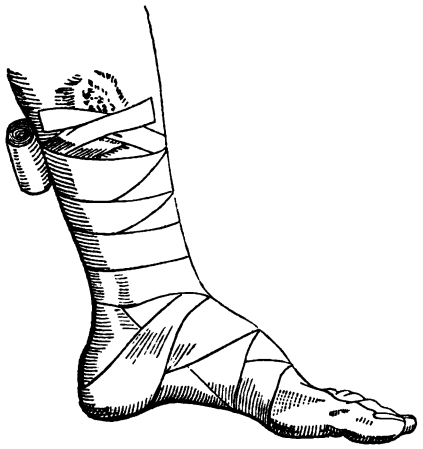
slight cause of irritation, may enlarge rapidly by ulceration or sloughing; and even when they have made considerable progress in healing, the granulations and cicatrices that have been months in forming may perish in a few hours from some constitutional disturbance or local injury,

TREATMENT.—The general rules are, to promote constitutional vigour by good diet and tonics, and to excite the local actions by various stimulants. The patient should take moderate exercise; but when he is at rest, the affected limb should not be permitted to hang down. In treating these cases, we must endeavour not only to effect a cure, but to make it permanent; and this can only be insured by attending to the growth of the granulations, and rendering them as healthy and firm as possible.

The following is perhaps the best plan of treating these ulcers. A number of pieces of lint, thoroughly soaked in the nitric acid lotion, should be laid in the sore, and be covered with a warm soft poultice. These applications should be changed twice a day, and be continued till the discharge becomes healthy, and granulations begin to arise. If there be any degree of inflammation about the parts, (which often happens when these ulcers first come under treatment,) the patient must be confined to bed and be purged. Afterwards, when the surface is clean, the following mode of dressing should be adopted. First, some pieces of lint, saturated with the nitric acid lotion, or zinc lotion, (F. 15,) or with some other of the preparations to be presently mentioned, should be laid on the sores. Then strips of adhesive plaster, about 1½ inch wide, should be applied *two thirds round the limb*, from an inch below the ulcer to an inch above it; and in applying each strip, the edges of the sore should be drawn together with a moderate degree of force. Next, a compress of soft linen must be placed over the plaster, and finally, the limb must be well and evenly bandaged from the toes to the knee; observing that the bandage is to be applied most tightly below, and more loosely by degrees as it ascends.

Baynton's Plan.—If, however, the whole limb be very much thickened, and the edges of the ulcers are very callous, it will be better to follow Mr. Baynton's method;*—that is, to encircle the *whole circumference* of the limb with strips of plaster, from an inch below to an inch above the ulcers:—each strip is to be first applied by its middle to that part of the limb which is opposite the ulcer, and then the two ends are to be brought forwards over it, and they should be long enough to overlap about two inches. A compress and bandage are to be applied afterwards. These modes of dressing almost always cause severe pain;—but it ought soon to sub-

* Baynton, T., Descriptive Account of a New Method of treating Old Ulcers of the Legs. Bristol, 1797.



side, and the part to feel stronger and more comfortable afterwards. If, however, it continue to be painful and hot, some pure water should be poured on the bandage from a watering-pot or teapot.

If the adhesive plaster irritate the skin, it may be diluted with soap-plaster;—or the isinglass-plaster may be substituted. Mr. Baynton employed a combination of 4 oz. of common lead-plaster with ℥ß of resin. The isinglass-plaster is made by dissolving isinglass in spirits of wine, and spreading the solution on silk. It readily adheres, if moistened with a warm sponge.

But although the plastering and bandaging are adapted for most cases, the immediate application to the ulcer will require to be frequently varied. Sometimes the strapping may be applied without anything else; or dry lint may be placed under it; or lint imbued with lotions of sulphates of copper, zinc, or alum; or the mineral acids; or the tinctures of myrrh, benzoin, or aloes;—or the balsams of copaiba or Peru; but metallic preparations agree better in general than the vegetable. Ointments agree better with the indolent than with the other varieties of ulcer, because they do no harm if rancid. The ung. hyd. nitric. oxyd. is very useful;—and the ung. hydrarg. nitrat. dilut. is praised for its efficacy in reducing thick callous edges.

If a crop of granulations threaten to slough, they should be

fomented with hot decoction of poppies, to which a little spirit of wine has been added. The gastric juice of animals is said to be a specific for certain sloughing ulcers occurring in persons debilitated by the use of ardent spirits, and salt provisions, and by residence in hot climates. During any febrile disturbance of the system, the local applications must be mild.

Mr. Skey's Plan.—Mr. Skey, conceiving that the chief obstacle in the cure of these ulcers is the want of a vigorous capillary circulation;—and seeing that opium produces an uniform warmth of skin, and excites the circulation in the remotest parts, proposes to employ it in the treatment of these cases. He recommends it to be given in doses of half a grain night and morning, which may be increased gradually according to its effects. He says that this treatment, without any local applications, will suffice for the cure of all weak and indolent ulcers, especially if the patient be old, and reduced by intemperance or starvation. He observes that in general the opium proves rather laxative than otherwise; and that it will have no ill effect in any case, whilst artificial support is needed;—or whilst the natural powers are languid;— or "so long as there remains a drain on the circulation." Not that it is to be used when inflammation is *active*, and ulceration is proceeding; for it "uniformly excites whatever action it may find;" and "all positively morbid action must have ceased, or nothing but evil will be accomplished." Mr. Skey also recommends the employment of opium with a similar view in other cases of deficient circulation, or passive congestion,—as in chronic catarrh, and the red noses of drunkards; and in phagedæna after the active symptoms have been combated.

Should old ulcers be healed?—The propriety of healing old-established ulcers will sometimes be made a question, inasmuch as certain diseases, and especially apoplexy and palsy, are apt to supervene on their suppression. Sir E. Home has specified the following cases in which a cure ought not to be attempted. 1. If the ulcer be "evidently affected with the gout, having regular attacks of pain, returning at stated periods; and those attacks similar to what the patient has experienced from gout in other parts." 2. If an ulcer habitually occur whenever the constitution is disordered. 3. If the patient be very infirm and old; for under these circumstances the removal of an habitual source of irritation, or the diversion of an habitual afflux of blood, may prove fatal;—more especially as very old ulcers have been known to heal spontaneously a short time before death. In the two first cases, however, an issue placed in a convenient situation might be substituted for an ulcer in an inconvenient one. But in other cases, where the ulcer has not displayed any connexion with constitutional disorder, there need be no reluctance to heal it, provided that the secretions are liberally kept up during the cure, and for some time afterwards. And if any symptoms of congestion in the head or other organ should arise, an issue may be inserted in

the arm. Whately* mentions a case in which an ulcer was healed, but some time afterwards it re-appeared of itself, and soon after that the patient died suddenly; and he observes that his death would infallibly have been attributed to the healing of the sore, if it had occurred before its second outbreak.

VI. The *Fistulous Ulcer* (Fistula or Sinus) is a variety of the indolent, and consists in a narrow channel lined by a pale pseudo-mucous membrane, which may or may not lead to a suppurating cavity. In old cases the parietes of the tube are often dense and semi-cartilaginous.

CAUSES.—Fistulæ are produced when abscesses are not thoroughly healed from the bottom, and when their sides have been too hastily approximated, or when there is some standing cause of irritation, as a ligature, or a piece of dead bone.

TREATMENT.—The first indication is to prevent the lodgment of matter; for which purpose it may perhaps be necessary to make another opening. The second indication is to produce the adhesive inflammation;—to which the mucous lining is naturally indisposed. The means to be adopted are, stimulant injections, (F. 17,) the introduction of tents smeared with irritating ointments; or the caustic bougie; or a seton consisting of a few threads of silk may be passed through the fistula, and may be gradually diminished as the passage contracts. When the adhesive inflammation has been excited by these means, graduated pressure should be made, that the sides may coalesce. If these means fail, the fistula should be slit up with a bistoury; and then a thin piece of lint be introduced in order to prevent premature union of the cut edges, and make it heal from the bottom.

If there have been a succession of small unhealthy abscesses in a part;—or if ulceration have spread irregularly in the cellular tissue, so as to leave the skin ragged, and extensively undermined with tortuous sinuses, it will be advisable to destroy the whole of the parts so diseased by the potassa fusa; and this will stimulate the neighbouring sound parts, so that when the slough separates, a healthy surface will be left, which may be healed by the ordinary means.†

VII. The *Varicose Ulcer* occurs in consequence of a varicose state of the veins of the lower extremity. This greatly impedes the return of blood, and, by producing habitual venous congestion, weakens the parts, and renders them prone to ulceration. The ulcers are usually three or four in number; situated above the ankle. They are oval in shape, indolent in their progress, and neither extensive nor deep;—but they are attended with consider-

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* Whately, T., Practical Observations on the Cure of Wounds and Ulcers. Lond. 1816, p. 144.

† Liston, Elements of Surgery.

able pain, which is of a deep-seated, aching character, and not sore like that of ordinary ulcers.

Treatment must be directed principally to the veins, and may either be palliative or radical; but for this we must refer to the chapter on that subject. We will merely observe here, that the ulcers must be treated according to their condition, whether irritable or indolent;—and that great relief to the pain is frequently obtained by opening one of the enlarged vessels, and abstracting a moderate quantity of blood. The advantages of proper support by bandages &c. needs scarcely to be noticed. Sometimes there is a constant desquamation of the cuticle, with serous discharge, for which the best remedies are equal parts of lime-water and milk, or the ointment of oxyde of zinc.

VIII. The *Sloughing Ulcer* is formed whenever either of the other varieties of ulcer is attacked with sloughing;—which is particularly liable to occur to the *indolent*, when subjected to undue irritation. Or, this name may be given to ulcers originally produced by a sloughing of the skin;—as on the legs of the dropsical.

TREATMENT.—The best applications are warm spirituous fomentations and stimulating poultices of yeast or carrots; or the nitric acid lotion.

IX. *Phagedæna* is a peculiar variety of ulceration extremely rapid in its progress. The surface of the sore is irregular, generally whitish or yellowish; the matter scanty and bloody; and the pain extreme. Some cases are attended with fever and acute inflammation, the margin of the sore being highly painful, swelled, and red.

CAUSES.—This disease may be induced either by extraordinary local irritation, or by some peculiar constitutional disorder. It may attack primary venereal sores in consequence of filth, intemperance, or the abuse of mercury;—or it may be an aggravation of secondary syphilitic ulcers in the skin or throat. Sometimes it appears in the throat after scarlatina;—it may attack a blistered surface when the constitution has greatly suffered from an acute and exhausting disease, as measles, &c.;—in many instances it affects the mouth or genitals of children, constituting *cancer oris; phagedæna of the mouth; noma, &c.*

TREATMENT.—If the habit be inflammatory and the pulse full and strong, bleeding, with the antiphlogistic regimen, should be employed. If the condition of the system be the reverse, tonics and narcotics, (FF. 1, 2, 3,) should be administered, and the diseased surface should be destroyed by nitric acid in the manner to be presently described.

X. *Sloughing Phagedæna** *(Phagedæna Gangrenosa, Hospital Gangrene)* seems, says Mr. Lawrence, to be the unhealthy state last described, carried to its greatest extent.

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* Of which the best description is that by Mr. Welbank, in M. C. T. Vol. 11.

CAUSES.—It may either arise from the same causes in greater intensity, or may in its worst forms be the result of a specific contagion. In the cases seen in civil practice, the disease is mostly seated in or near the genital organs; in the cleft of the nates, in the groin, or at the upper and inner part of the thigh. It often, but far from invariably, supervenes on syphilitic ulcers; especially in young prostitutes who have been exposed to cold and wet, and privation of solid food, and the abuse of ardent spirits. It is especially liable to be induced by the too free administration of mercury, or by intemperance and exposure to wet during a mercurial course. The worst cases, however, appear to arise from neglected local irritation, without any specific virus; as from acrid discharges and defective cleanliness. Mr. Lawrence mentions the case of a young woman who had suffered from severe small-pox, and from diarrhœa after it. The continual moisture of the rectum, with a mucous discharge from the vagina, irritated and inflamed the skin of the nates, and caused a large sloughing phagedænic excavation on both sides.

SYMPTOMS.—"It usually commences as a highly irritable and painful boil, surrounded by a halo of dusky red inflammation, and much elevated; the patient also in general having mucous discharges from the vagina, and a diffused redness of integument in the vicinity of the pudenda." There are severe darting and stinging pains; at first intermittent, but gradually establishing themselves as a constant symptom, with occasional exacerbations. When the pustule is ruptured, the exposed surface of the ulcer displays a stratum of adherent straw-coloured flocculi, mottled with darker points of reddish brown and grey. The sore thus formed soon enlarges in breadth and depth;—the edges become everted, and attended with a circumscribed thickening, which is surrounded by dusky inflammation and diffused puffy swelling. The surface is composed of grey or ash-coloured sloughs, which may become brown, or resemble coagula of blood. The discharge is reddish-brown and peculiarly fetid, and there is occasionally severe hæmorrhage. Meanwhile the agonising pain, the hæmorrhage, and the absorption of putrid matters, soon induce severe irritative fever;—ushered in by loss of sleep, anxiety, restlessness, and thirst; which, with an exhausting diarrhœa, produce death in about three weeks; and as delirium is rare, the patient retains a miserable consciousness of severe suffering till the end. This disease is highly contagious, being extended and produced by its acrid secretions. It appears also to be a *local* disease, and both the constitutional and local symptoms may be removed by measures which destroy those secretions.

Hospital Gangrene is the name given to this affection when occurring in military and naval practice.

CAUSES.—Like other putrid maladies, it is engendered by crowding together a number of sick and wounded men;—and by inatten-

tion to cleanliness and comfort, and to free ventilation, which is so necessary for carrying off the noxious miasmata always generated under those circumstances. It frequently is a concomitant of dysentery or typhus, originating in the same sources. It may affect any kind of wound, or even a bruise, unaccompanied with external solution of continuity.

PROPAGATION.—This disease, when once generated, may either spread by *contagion;* that is, may be propagated by the contact of its morbid secretions;—or may be *infectious;* that is, propagated through the medium of its vapour or effluvium. It may, although rarely, occur *sporadically;* that is, may be induced in isolated cases by improper and irritating local and constitutional treatment of the wounded.

SYMPTOMS.—According to Mr. Blackadder, it begins in the form of a livid vesicle at the edge of a wound or sore, accompanied with an occasional painful sensation like the sting of a gnat. Sometimes it first appears as a small livid spot on the sore, and near its circumference. In either case the disease soon spreads, and converts the whole surface of the ulcer into an ash-coloured or blackish slough. The discharge, if previously healthy, is at first diminished in quantity, and sanious;—but soon becomes profuse, and dirty yellowish or brown. According to this gentleman, the hospital gangrene is at first a purely *local* affection, like the phagedæna gangrenosa;—and he says that the constitutional symptoms (typhoid fever, &c.) do not make their appearance before the third or fourth, sometimes not till the twentieth day.*

DR. HENNEN'S ACCOUNT.—The following quotations, however, from Dr. Hennen, display a slight variation from Mr. Blackadder's account. "Let us suppose," says Dr. H., "that our wounded have all been going on well for several days, when suddenly one of our most promising patients complains of severe pain in his head and eyes, a particular tightness about the forehead, loss of sleep, and want of appetite; and that these feelings are accompanied with quickness of pulse and other symptoms of fever; his wound, which had been healthy and granulating, at once becomes tumid, dry, and painful, losing its florid colour, and assuming a dry and glossy coat. This is a description of the first stage of our Bilbao hospital gangrene, and if a brisk emetic were now exhibited, a surgeon, not aware of the disease that was about to form, would be astonished at the amelioration of the sore, and the unusual quantity of bile and of indigested matter evacuated by vomiting."—"If this incipient stage was overlooked, the febrile symptoms soon became aggravated; the skin around the sore assumed a higher florid colour, which shortly became darker, then bluish, and at

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* Observations on Phagedæna Gangrenosa. By H. Home Blackadder. Edinburgh, 1818.

last black, with a disposition to vesicate; whilst the rest of the limb betrayed a tendency to œdema. All these threatening appearances occurred within twenty-four hours;—and at this period the wound, *whatever might have been its original shape, soon assumed the circular form.* The sore now acquired hard prominent ragged edges, giving it a cup-like appearance, with particular points of the lip of a dirt-yellow hue; while the bottom of the cavity was lined with a flabby, blackish, slough. The rapid progress and circular form were highly characteristic of hospital gangrene."—"The discharge in this second stage became dark-coloured and fetid, and the pain extremely poignant."—"The face of the sufferer assumed a ghastly, anxious appearance; his eyes became haggard, and deeply tinged with bile; his tongue loaded with a brown or blackish fur; his appetite entirely failed him, and his pulse was considerably sunk in strength, and proportionably accelerated."—"The third and last stage was now fast approaching. The surface of the sore was constantly covered with a bloody oozing; and on lifting up the edge of the flabby slough, the probe was tinged with dark-coloured grumous blood, with which also its track became immediately filled; repeated and copious venous bleedings now came on;"—"at length an artery sprung, which, in the attempt to secure it, most probably burst under the ligature."—"Incessant retchings soon came on, and, with coma, involuntary stools, and hiccough, closed the scene."*

It thus appears, by collating the observations of these two military authorities, that the hospital gangrene may either be a *local disease*;—being produced by local contamination of a wound, and existing for some days before the system at large is affected by it;—or it may be *constitutional* from the first;—that is, may be induced by the absorption of poisonous miasmata into the blood; and in this latter case the constitutional symptoms precede the local mischief. In fact, the ordinary constitutional symptoms of hospital gangrene might be induced in the nurses and attendants on the sick, from washing the bandages, and from general exposure to noisome effluvia, without being followed by any local affection whatever.

Treatment.—The indications in the treatment of all the forms of sloughing phagedæna are, 1, to destroy the diseased surface and its secretions;—and, 2, to correct the concomitant contamination of the system.

The first indication is to be carried into effect by means of caustics. The French use the actual cautery; Mr. Blackadder recommends the liq. arsenicalis;—but the concentrated nitric acid, as employed by Mr. Welbank, seems preferable to either. In the first place, the sore must be thoroughly cleansed, and all its mois-

* Principles of Military Surgery. By John Hennen, M. D., F.R.S.E. 3rd ed. London, 1829, pp. 217 *et seq.*

ture be absorbed by lint or tow. If the sloughs are very thick, they may be removed by means of forceps and scissors. The surrounding parts must next be defended with a thick layer of ointment; then a thick pledget of lint, which may be conveniently fastened to the end of a stick, is to be imbued with the acid, and to be pressed steadily on every part of the diseased surface till the latter is converted into a dry, firm, and insensible mass. This application of course causes more or less pain for the moment, but when that subsides, the patient expresses himself free from his previous severer sufferings. The part may then be covered with simple dressings, and cloths wet with cold water. "It is always prudent, often necessary," says Mr. Welbank, "to remove the eschar at the end of sixteen or twenty hours; and then, if the patient be free from pain, and the ulcer healthy and florid, it is to be treated with common stimulating dressings;—such as cerat. calaminæ, or solution of argenti nitras;—or a cerate of turpentine, which may be melted and poured in warm." If, however, there be any recurrence of pain, or the least reappearance of the disease, the acid is again and again to be applied till a healthy action is restored. As for the general treatment;—if the constitution be not affected, (as in Mr. Welbank's cases,) opium may be given to allay the pain caused by the disease, and by the application of the escharotic; the bowels should be opened, and the diet regulated. If the disease, as observed by Hennen, begin with fever of an inflammatory type, and the patient be robust, and the local inflammation intense, a moderate blood-letting may be performed with advantage; with an emetic, purgatives, and the antiphlogistic regimen generally. Mercury is for the most part highly pernicious,* (although Mr. Babington says that it may be employed with advantage, if the surrounding inflammation be vivid and intense.) If, however, the constitutional affection assume a low or typhoid type, either from the beginning or subsequently, the principal dependence is to be placed on opiates and tonics, in order to allay irritation and support the strength, (having first used emetics and cordial laxatives.) If there be much diarrhœa, bark will be hurtful.

Prevention.—But, above all things, it will be most necessary to prevent the spreading of this dreadful affection by the freest ventilation, by frequent ablution of the bodies of the sick and wounded, and changes of their bedclothes and linen;—by the instant removal of all excrements or filth;—and by the most scrupulous care in washing the bandages in boiling water, if they are to be again used, and in destroying them immediately if they are not. The walls also should be daily whitewashed, and the floor perpetually sprinkled with a solution of the chlorides. If the disease has commenced, all the affected patients should be instantly

* Lond Med. Journ., vol. lviii. p. 288.

removed to the greatest possible distance from the others; everything connected with them should be thoroughly cleansed, and the utmost care be taken not to convey the infection by means of sponges or dressings, or even by the fingers or instruments of the surgeon; in fact, tow or lint might well supersede sponges, as they might be destroyed after using.

XI. *Morbid Ulcers.*—Under this term Sir E. Home includes a variety of ulcers connected with a disordered state of the constitution, and capable of being removed by particular remedies. Arsenic is said by Mr. Eccles* to be highly useful in sores which are dry and little inflamed, and surrounded by much scabbing and exfoliation of the cuticle. Ulcers about the instep and foot, with their edges and the surrounding skin much and extensively thickened like elephantiasis; and often occurring in the lazy and overfed servants of the opulent;—sometimes yield to mercurial fumigations, or the application of mercurial ointment with camphor.

XII. The *Cutaneous Ulcer* spreads widely but superficially over the skin, and often heals in one part whilst it spreads to another.

Treatment.—Any constitutional disorder must be ascertained and remedied. The best local applications are stimulants, especially the arg. nit., employed in solution, or rather on Mr. Higginbottom's plan.

XIII. The *Ulcer of the Cellular Membrane*;—which destroys that tissue more widely than the skin, must be treated as the fistulous or weak, according to circumstances.

XIV. *Menstrual Ulcer.*—This name is given to ulcers occurring in chlorotic young women, and exuding a sanguineous fluid at the time of their monthly discharge, if that be absent. Wounds made in operating will frequently do the same.

Treatment.—The constitutional disorder must be remedied by proper emmenagogues, and the ulcer be treated on general principles.

XV. *Ulcers about the Nails.*—1. A very common and troublesome affection is that which is popularly termed "the growth of the nail into the flesh," and which most usually occurs by the side of the great toe. It does not, however, arise from any alteration in the nail, as its name would imply, but the contiguous soft parts are first swelled and inflamed by constant pressure against its edge from the use of tight shoes. If this state be permitted to increase, suppuration occurs, and an ulcer is formed with fungous and exquisitely sensible granulations, in which the edge of the nail is embedded, and which often produces so much pain as totally to prevent walking.

Treatment.—The objects are, to reduce the swelling of the soft

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* Eccles on the Ulcerative Process and its Treatment. Lond. 1834.

parts, and remove the irritation caused by the nail. A leech or two, with poultices and perfect rest, should be used for a day or two, if necessary, to remove inflammation, and then the diseased surface should be well rubbed with arg. nit. to repress the fungous granulations, and cause absorption of the surrounding thickening. In slight cases it will be sufficient to introduce under the edge of the nail a very soft small piece of the *flue* of lint; but this often aggravates the matter. It is in all instances useful to soak the nail in warm water, and then shave its middle quite thin with a piece of glass; at the same time cutting a notch in the shape of a V from its anterior border, in order that its edges and corners may be inclined to rise. If, however, none of these measures succeed, it will be necessary to remove the edge of the nail, which may be done in the frightfully painful way laid down by Sir A. Cooper and Dupuytren; that is, by passing the sharp blade of a pair of scissors under the nail, cutting it through, and then tearing away the offending portion with forceps. Or it may sometimes be effected in a milder way, by cutting through the nail with a penknife, just down to the thick layer of cuticle intervening between it and the quick, (as it is called,) and then it may be turned back easily.* If the complaint return after this, the whole nail had better be removed by the application of a blister; but in some cases it has been necessary to dissect it out altogether, together with the gland that secretes it. Persons disposed to this affection should always wear loose shoes, and cut their nails square without removing the angles.

2. *Onychia Maligna*† is a peculiar unhealthy ulcer occurring at the root of the nail, either of the fingers or toes, but more frequently the latter. It commences with a deep red swelling, and an oozing of a thin ichor from under the fold of skin at the root of the nail; and lastly an ulcer is formed, with a smooth tawny or brown surface, a very fetid sanious discharge, and swelled jagged edges of a peculiar livid, dusky hue. It varies in the rapidity of its progress, but is in general extremely painful, especially at night.

TREATMENT.—Mr. Wardrop recommends mercury to be employed, so as to affect the gums in about a fortnight; and says that then the swelling will generally subside, and the ulcer become clean. The mercurial effect should be continued gently till the sore is healed, and for a short time afterwards. The best local applications are solution of hydr. bichlor., to clean the wound, and keep down fungus. But, before resorting to this, it will be better to try the solution of arsenic, (liq. arsen. ℥ij ad aq. ℥ij,) as recommended by Mr. Abernethy, and it will generally be found to succeed.

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* Lawrence, Lectures in Med. Gaz.

† James Wardrop, F.R.S.E., on Diseases of the Toes and Fingers. M. C. T., vol. v.

CHAPTER IX.

OF MORTIFICATION.

SECTION I.—OF THE PATHOLOGY OF MORTIFICATION.

DEFINITION.—Mortification signifies the death of any part of the body, in consequence of injury or disease.

VARIETIES.—Some persons use the terms *mortification*, *gangrene*, and *sphacelus*, indiscriminately; but the majority signify by *sphacelus* an utter and irrecoverable loss of life;—and restrict the term *gangrene* to the state which precedes, and commonly (but not inevitably) terminates in sphacelus;—a state in which, as Thompson says, "there is a diminution, but not a total destruction, of the powers of life;—in which the blood appears to circulate through the larger vessels; in which the nerves still retain a portion of their sensibility, and in which perhaps the part may still be supposed to be capable of recovery." Another distinction is made between *humid* and *dry* gangrene. The *humid* is often the consequence of inflammation, and the mortified part being loaded with fluid effusions soon undergoes decomposition;—whilst the *dry gangrene* is either preceded by no inflammation at all, or by one so rapid that there is no time for interstitial effusions to occur, and the mortified part becomes dry and hard;—in the first case being called a *slough*, in the latter an *eschar*. Another and a most important division is into constitutional and local. By *constitutional* mortification is meant that which is idiopathic, or which primarily originates in constitutional disorder;—or that which, having begun from a local injury, is propagated and maintained by constitutional disorder. By *local mortification* is understood that by which the system is not implicated, and with which it does not sympathise in a violent or dangerous degree.*

CAUSES.—The causes of mortification may be divided into constitutional and local. (*a*) The *constitutional* causes are,—debility from old age, poverty, starvation, hæmorrhage, scurvy, or long-continued disease of any kind;—disease of the heart with contraction of the aortic orifice, so as to impede the arterial circulation;—and the peculiar state induced by the use of diseased grain, especially by the ergot of rye. Most of these causes are in general *predisposing* merely; but sometimes they are sufficient of themselves to induce mortification, which is then mostly seated in the lower extremities. (*b*) The *local causes* may be classified, 1st, into

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* Guthrie, G. J., F.R.S. A Treatise on Gunshot Wounds, p. 116. 3rd ed. Lond. 1827.

those which produce *immediate death* by destroying the structure or vital properties of the part; as violent mechanical injuries;—very severe bruises;—extreme heat;—the strong acids and alkalis, and other corrosive poisons;—or substances like arsenic, which act on the nervous and vital functions. 2ndly, Causes inducing mortification *from excess of inflammation;* as mechanical and chemical injuries of less intensity than the preceding;—the injection of urine or other stimulant fluids into the cellular tissue;—the application of irritants in constitutions weakened by previous disease; as the application of blisters to children after measles or scarlatina;—long-continued pressure under the same circumtances; hence the sloughing of the skin over the sacrum or trochanters of patients confined to bed with some exhausting disease;—or the application of heat after exposure to cold. 3rdly, Causes which affect either the circulation or nervous influence of the part, as (*a*) deficient supply of arterial blood, from ligature of an artery;—from disease of its structure; or from coagulation of the blood within it, or effusion of fibrine into it, as in arteritis;—or from ossification of the artery, and its conversion into a ligamentous cord, which is the cause of senile gangrene. (*b*) Obstacles to the return of venous blood;—from ligature, or constriction, or tumours, or disease of the heart, or coagulation of the blood contained in the veins. (*c*) Injury or division of the nerves, as, for instance, the sloughing of the cornea from division of the fifth; this is, however, more frequently a predisposing cause merely.

The tissue most disposed to mortification is the cellular; and next to it, tendinous and ligamentous structures, if the cellular tissue surrounding them have been destroyed; then bone, if deprived of its periosteum;—next the skin, especially if the subjacent cellular tissue have mortified, or have become infiltrated with fluid; and lastly, parts of higher organisation, as muscles, blood-vessels, and nerves, resist it most.

SECTION II.—OF THE SYMPTOMS AND TREATMENT.

SYMPTOMS.—When inflammation is about to terminate in mortification, its redness gradually assumes a darker tint, and becomes purple or blue;—the heat, sensibility, and pain diminish; but the swelling often increases in consequence of the continued effusion of sanguinolent serum, which not unfrequently exudes through the skin, and elevates the cuticle into blisters. If the *gangrene* proceed to *sphacelus*, the colour becomes dirty brown or black; the parts become soft, flaccid, and cold, and they crepitate when pressed, and emit a cadaverous odour from the gases that are evolved by incipient putrefaction. Whilst gangrene is spreading, the dark colour is diffused, and insensibly lost in the surrounding skin; but when its progress is arrested, a healthy circulation is re-established up to the very margin of the sphacelated portion, and

a bright red line of adhesive inflammation (called the *line of demarcation*) separates the living parts from the dead. And the appearance of this line is most important as a means of *prognosis*, because it shows that the mischief has ceased, and that there is a disposition to repair its ravages.

Separation of the Mortified Part.—It is at this line that the dead part is separated;—and this separation is said, according to Hunter's theory, to be produced by ulcerative absorption; although, according to J. W. Earle, it is more probably the mere result of the softening and suppuration of that layer of the living parts which is contiguous to the dead. Be this, however, as it may, a narrow white line, consisting of a narrow circular vesicle, and formed by a separation of the cuticle, first appears on the bright line of adhesive inflammation before mentioned;—and when this is broken, a chain of minute ulcers are seen under it. These gradually unite and form a chink;—which widens and deepens till the slough is entirely detached;—and then a granulating and suppurating surface remains. In this manner the whole of a mortified limb has been spontaneously amputated;—the bone and tendons separating higher up, and being more slowly detached than the skin, muscles, and blood-vessels. When the adhesive inflammation has duly occurred, this process of separation is unattended with hæmorrhage; the smaller vessels being, as Dr. Carswell thinks, obliterated by the effusion of lymph, and the larger ones by the coagulation and organisation of the blood within them. And this coagulation extends some distance from the mortified part, so that a limb has been amputated in the thigh for mortification of the leg, without the loss of any blood from the femoral artery. Sometimes, however, as in hospital gangrene, these vital processes of adhesion are deficient, and the blood is found fluid in the vessels, so that the separation of the slough is attended with severe hæmorrhage.

Constitutional Symptoms.—The constitutional symptoms of mortification vary with its cause. If it arise in a healthy subject, from acute inflammation which is still progressing, there will be healthy inflammatory fever;—but, on the other hand, if the mortification be very extensive;—if the inflammation of the adjacent parts be unhealthy, with no disposition to form the line of demarcation, but, on the contrary, with a great tendency to serous effusion;—or if the mortified part be of great importance, as intestine or lung, the constitutional symptoms will be of a low typhoid cast;—there will be great anxiety, hiccough, a jaundiced skin, a soft or rapid, thready, and jerking pulse; and frequently profuse perspiration of a cadaverous odour.

Diagnosis.—It is important not to mistake the lividity and vesications of bruises, especially when they accompany fractures, for gangrene. They may easily be distinguished by their sensibility and temperature; and by the fact, that in gangrene the whole

cuticle has lost its adhesion to the cutis, so that pressure will cause the vesicle to shift its place. If there be any very great doubt, an incision may be made.

TREATMENT.—The general indications are, to allay inflammation if excessive;—to support strength; and to cause the formation of a line of healthy adhesion, by which the mortification may be arrested.

If there be an acute inflammation which threatens to terminate in gangrene;—or if gangrene have actually occurred in a healthy, young, robust subject, with great pain, and a full, hard, strong pulse; and if it appear likely to spread from the violence of inflammation;—it will be necessary to prevent its occurrence or extension, by bleeding, purging, and the general antiphlogistic treatment; whilst leeches, poultices, or lotions may be applied locally. But care must always be taken to reduce the strength as little as possible, whenever a part is so injured that its death is probable.

But an opposite treatment must be pursued if the pulse be quick and feeble, and there be the other signs of deficient vital power, that have been before mentioned. The principal remedies for this state are bark, opium, and wine;—their united effect should be to render the pulse slower and firmer, and to induce a warm gentle perspiration, and sleep;—whilst it will be a sign that they are injudiciously administered, if they induce or aggravate delirium and restlessness. The best form of administering the bark is a good decoction of *cinchona lancifolia*, to which opium, acids, ammonia, or other stimulants, may be added; as in F. 2, which is one of the best combinations that can be devised for cases of urgent debility. If the decoction disagree with the stomach, quinine may be given by itself in doses of three grains. *Opium* is of prodigious utility from its power of allaying irritability; so that it renders the constitution insensible as it were to the local mischief;—or in Hunter's language, "It does good by not letting the disease do harm to the constitution." At the same time, by supporting the capillary circulation, as justly insisted on by Mr. Skey, it favours the production of the much desired boundary line of adhesive inflammation. As to the dose and form;—it may in general be combined with the bark, in the dose of ℥xv. of the tincture every four hours; but if there be at any time very great restlessness, especially towards night, it will be better to give a full dose at once;—℥i of the tincture, or gr. iij. of the solid opium, will not be too much, if the patient have been taking it liberally before. Sometimes the solid form is preferable; a large dose (gr. iij.) being given in the form of pill, if vomiting be obstinate. Wine—especially port—and nutriment, in the shape of arrowroot, beef-tea, gruel, &c., should be administered at moderate intervals.

LOCAL MEASURES.—If a part be gangrenous, but not quite dead, its temperature must be carefully maintained, and its actions sup-

ported without over-stimulation. As a general rule, warm poultices suffice, if there be active inflammation in the vicinity;—but if there be not, warm fomentations of spirit of wine and poppy decoction may be used, or a poultice moistened with camphorated spirit.

If sphacelus has actually occurred, and the powers of the system and of the part are languid, stimulating applications are necessary, in order to excite healthy action in the adjacent living parts. Nothing is better than the nitric acid lotion, which may be liberally poured on the parts, and afterwards applied on lint under the poultice. The ung. resinæ, or basilicon, thinned with turpentine;—the balsam of Peru;—tincture of myrrh, or of benzoin;—solution of the chlorides properly diluted;—or poultices of yeast, (F. 26,) or of stale beer grounds, are also capable of fulfilling the same indications. Any loose portions of slough may be cut away by scissors, taking care not to tear them away violently from the parts beneath.

Incisions are of great service in spreading inflammatory mortification, attended with extensive effusion of serous or purulent fluids; which not only contaminate the blood, and depress the nervous system by their absorption, but also propagate the disease by diffusing themselves into parts that are still sound, and rendering them incapable of healthy inflammation.

Question of Amputation. — When a portion of an entire limb has mortified, it will be expedient to perform amputation, in order to avoid the delay and annoyance of a spontaneous separation. And the operation may in any case be performed as soon as the disease is arrested, and a line of demarcation is established;—but not till then, otherwise the stump may become gangrenous; provided always that the patient has vigour enough to bear the loss of blood which must in some degree necessarily ensue. Sir A. Cooper mentions a case in which a mortified leg was separating favourably through the calf, when the projecting bones were sawn off, with the view of expediting the process. A few granulations were accidentally wounded, and the trivial hæmorrhage that ensued was fatal.*

But still it will be proper to *amputate, without waiting for the line of separation,* if the mortification be strictly local as to its cause, and if it have not yet affected the constitution;—as, for instance, in mortification of a limb from injury or aneurism of the large arterial trunks; or from severe compound fracture. And as far as can be gathered from the works of Guthrie, Larrey, and James, it is justifiable as a last resource wherever there appears little or no disposition to limit gangrene, and whenever it spreads rapidly. "Where gangrene," says Mr. Guthrie, "is rapidly extending to-

* Lectures by Tyrrell, vol. i. p. 237.

wards the trunk of the body, without any hope of its cessation, the operation is to be tried; for it has certainly succeeded, where death would in a few hours have ensued."*

Mortification *from obstacle to the return of venous blood*, mostly affects the lower extremities, and is always preceded by great œdema. It may either occur *before* inflammation, or may be a *consequence* of inflammation, which in œdematous parts is always liable to terminate in gangrene. In the former case, the skin of the œdematous limb having become pale, smooth, glossy, and tense, assumes a mottled aspect of a dull red or purple colour from distension of the subcutaneous veins. "Then, at some part where the congestion is greatest, or where the skin is less yielding, as over the tibia, or above the malleoli, phlyctenæ, or large bullæ, are formed by the effusion of serosity, either alone or mixed with blood, under the cuticle. When these burst, the cutis beneath presents a dark red or brown colour, and very soon is converted into a dirty yellow or ash-grey slough."† After the spread of the mortification to a given extent, inflammation occurs; and the slough, which is mostly an oval patch of skin and cellular tissue, separates, and the ulcer thus formed is to be treated as before described.‡

SENILE GANGRENE.

Symptoms.—This affection commences by a purple or black spot on the inner side or extremity of one of the smaller toes; from which spot "the cuticle," says Pott, "is always found to be detached, and the skin under it to be of a dark red colour." "In some few instances, there is little or no pain; but in by far the majority, the patients feel great uneasiness through the whole foot or joint of the ankle, particularly in the night, even before these parts show any mark of distemper, or before there is any other than a small discoloured spot at the end of one of the little toes."§ Its progress in some cases is slow, in others rapid and horribly painful. After its first appearance, the discoloration will generally be preceded in the parts successively attacked, by a dark red congestive inflammation. The dead parts become shrunk, dry, and hard; and when the disease makes a temporary pause, which it frequently does, they slowly slough away; but a fresh accession of gangrene mostly supervenes before any progress has been made towards cicatrisation. In this way the patient may live several winters, but generally sinks exhausted with the nocturnal pain before the whole foot is destroyed.

Pathology.—This disease depends on deficient arterial circula-

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* Op. cit. p. 132. † Carswell, op. cit.
‡ Vide "sloughing ulcer" in the last chapter.
§ Pott's Chirurgical Works. 8vo. Lond. 1771.

tion; which is supposed by Andral to be the result of debility of the capillaries, with coagulation of the blood in them; but it generally results from ossification of the arteries, and obliteration of the smaller trunks, which are converted into ligamentous cords by a fibrous tissue generated in their cavities or between their walls.

This affection mostly happens to old persons, especially if they have been great eaters. They are generally found to have lost their hair and teeth, and their face and hands betray a languid circulation. It mostly attacks men.*

TREATMENT.—The general health and strength must be supported; but the chief reliance is to be placed on opium, both in order to soothe the pain and support the capillary circulation. The solid form is best, and it should be given in sufficient quantity to procure ease and sleep. *Locally*, gently stimulating poultices of beer grounds, port wine, and oatmeal, the chlorides of soda and lime, &c. Amputation may perhaps be justified in very few cases.† Pott mentions the curious fact, that the ligaments by which the dead loose bones may be retained, often preserve their sensibility, and cause intense pain if cut through.

GANGRENE FROM PRESSURE.—During any long and tedious confinement to bed, especially from some very debilitating malady, as a fever;—or if from any circumstances the patient is unable to change his posture, the skin covering various projecting bony parts, (as the sacrum, brim of the ilium, or great trochanter,) is apt to inflame and rapidly ulcerate or slough; and more particularly if irritated by neglect of cleanliness, or by the contact of urine. The first thing often complained of by the patient is a sense of pricking, as though there were crumbs or salt in the bed; and this sensation is caused by a number of little scales of the cuticle, which have been detached from the irritated parts, and of very small particles of lymph which exude and dry on the surface. The part, if examined at first, looks red and rough; then becomes black, and dies.

Treatment.—If detected before actual sloughing, the best plan is to apply a piece of soap plaster to prevent friction;—if, however, sloughing has begun, a stimulating or fermenting poultice should be applied; and in either case it is indispensable to arrange small pillows or cushions, so as to take off all weight from the part affected.

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* Mr. James (on Inflammation, p. 545) relates a case in which it happened to a woman at forty-two; but she had disease of the heart.

† James, op. cit. p. 552.

PART III.

OF THE DIFFERENT SPECIES OF INJURIES.

CHAPTER I.

OF INCISED WOUNDS.

DEFINITION.—These are wounds made with clean-cutting instruments; they generally bleed more at first than the other kinds of wounds.

TREATMENT.—There are four indications;—1, To arrest hæmorrhage; 2, to remove foreign bodies; 3, to bring the divided parts into apposition, and keep them in union; 4, to promote adhesive inflammation.

I. To arrest hæmorrhage, moderate pressure, a raised position, and the application of cold, will be sufficient in most cases;—but if an artery have been wounded, or the bleeding prove obstinate, the measures must be adopted which will be indicated in the Chapter on Wounds of Arteries.

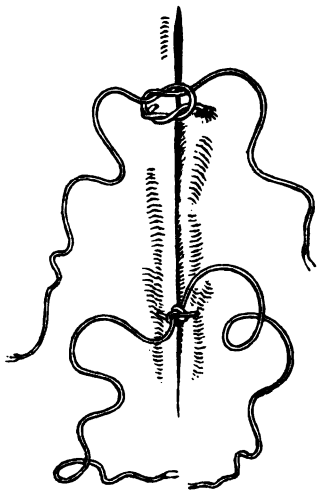
II. The removal of foreign bodies will be much more easy both for surgeon and patient if done at once, than if delayed till inflammation supervene. The best instruments for this and every other surgical purpose which they can perform, are the fingers;—but they may be aided by probes and forceps, if necessary. Dirt, gravel, &c. are best got rid of by affusion with water. All clots of blood must likewise be removed, or they will act as foreign bodies and prevent adhesion.

III. In order to bring the sides of the wound into apposition, the part must be placed so as to relax any muscular fibres that may have been divided, or that may be subjacent to the divided parts. Then the edges must be made to meet as nicely as they can without undue straining, and must be retained by cross strips of adhe-

sive or isinglass plaster, one end of the plaster being first applied to that side of the wound which is loosest, and the other being brought across with a mild degree of traction. If the wound, from its severity or situation, compel the patient to keep his bed, no further application will be needed save a cloth dipped in cold water;—otherwise a light compress and bandage may be applied to keep on the dressings, and protect the parts from injury. If the wound is so situated that the plasters cannot be applied smoothly, a slip of lint dipped in blood may be laid over it first. In fact, this last application is the very best *vulnerary balsam*, and might be used with benefit in most cases.

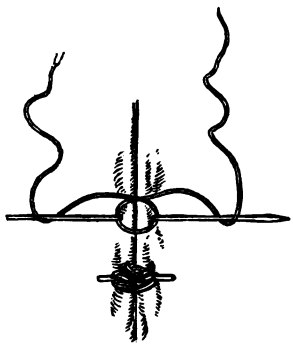
SUTURES.—In some cases it is requisite to have recourse to sutures; although from the pain occasioned by their application, and their tendency to produce suppuration, they should never be used if they can be avoided. *Five species* are enumerateed in the older authors.

1. The *Interrupted Suture* is thus made. A needle armed with a single ligature is passed through one lip of the wound *from without*, inwards;—then at a corresponding part through the other lip *from within*, outwards. Then the ends of the ligature (which should be made of good stay-silk, well waxed and flattened, that it may lie easily in the wound) are to be drawn together, without, however any great straining, and are to be tied tightly in a double reef knot, as represented in the adjoining figure.



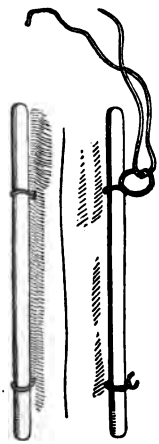
The needle should be carried deeply enough to obtain a firm hold, but should not include any tendinous part. As many of these stitches are to be made as are necessary; half or three quarters of an inch is a proper interval.

2. The *Twisted Suture* is made thus. The edges of the wound having been placed accurately in contact, a sufficient number of pins are to be passed through both of them, at convenient distances.



The first pin should be placed at any loose angle which there may happen to be. When all the pins have been introduced, and the parts are accurately adjusted, the middle of a long piece of silk is to be twisted around the uppermost, in the form of a figure of 8. Then the two ends are to be brought down and twisted round each of the other pins successively in like manner;—and, lastly, are to be secured by a knot.

The pins are usually made of silver with steel points, that may be removed after they have been inserted. The fine pins used by entomologists for fixing insects are excellent substitutes. They are so small that they excite little irritation; and a great number of them may be employed, so as to insure as nice an adaptation as possible.



3. The *Glover's* or *Continuous Suture* is nothing more than the ordinary way of sewing things together practised by seamstresses and housewives. It is sometimes employed in wounds of the intestines.

4. The *Quilled Suture* is performed by passing a sufficient number of ligatures, as in the interrupted suture. But instead of being tied to their opposite neighbours, all the threads on each side of the wound are fastened to a quill, or bougie, or roll of plaster. This suture is now nearly or quite obsolete; it was formerly supposed to be very advantageous in pressing the deep parts of a wound together.

5. The *Dry Suture* was made by sticking a strip of adhesive plaster, or (before that was invented) a strip of linen smeared with white of egg and flour, to the skin on each side of the wound. The adjacent margins of the plaster or linen were then sewed together.

Rules for the use of Sutures.—1. They are not to be used with the view of exerting great *force* in drawing the edges of the wound together, but simply with a view of obtaining a better *purchase.* 2. They are to be employed upon parts that are naturally loose and unattached, or that are very movable, or that have no firm part under them against which they can be fixed. Thus the *twisted* suture is used in wounds of the lips; and the *uninterrupted* in those of the scrotum — of the abdominal parietes — of the female perineum, or where a portion of the nose or ear has been detached; in fact, in those cases, and those only, where sticking-plaster would be insufficient. 4. Sticking-plaster may, if possible, be used as an auxiliary, to prevent any strain upon the pins or stitches. 5. They are to be removed about the fourth or fifth day, before they begin to ulcerate—sooner, if violent inflammation and suppuration come on; but not so soon, if there be no great action,—in order that adhesion may be more perfect.

IV. The fourth indication is to keep down inflammation; that is, to prevent it from surpassing the degree necessary for adhesion. This is to be effected by opening the bowels, lowering the diet, enjoining rest, avoiding tight bandages, and applying leeches and cold to the wound. If, however, pain and swelling should persist, and suppuration be established, poultices and fomentations must be substituted for plasters, bandages, and sutures;—and when granulations have formed, the parts may be approximated, that they may heal by the *second intention;* that is, by the inosculation of their granulations.

Cases of complete Disunion.—If any small portion of the body (a finger or part of the nose for instance) has been completely cut off, if it be reapplied as soon as possible, and retained by plasters or sutures, and wrapped up so as to preserve its temperature, it will very probably unite again. And even if such a part have been separated for a considerable time, the attempt should not be given up;—but it should be well washed in warm water to free it from dirt, and the stump should also be bathed, so as to remove any dry coagulated blood, before they are reapplied to each other. Part of the left forefinger, an inch and a half long, after having been cut off for twenty minutes, was replaced and united perfectly in four days. The case is related by Dr. Balfour of Edinburgh, and is quoted in Sir A. Cooper's Lectures.

If a part has been abstracted which cannot be restored; or if any kind of wound cannot be covered by skin, there are two ways in which it may heal. The first is, the *cure by granulation;*—the part being covered with a simple poultice, or the water-dressing, till inflammation has subsided, and then being treated as an ordinary ulcer.

The second method of cure is that by *scabbing;*—the natural and simple way in which most slight accidents heal when not interfered with by art. The blood is to be permitted to dry on the

surface of the wound ;*—or perhaps in some few cases a crust may be formed with the nitrate of silver, on Mr. Higginbottom's plan. Under this protection the wound heals without suppuration.

In the following cases no attempt should be made to bring the divided parts together, or to procure adhesion ; (1.) When the skin cannot be brought into contact with the parts beneath it ;—as after castration, and the removal of certain tumours ; because the closure of the wound, by confining matter and causing sinuses, only protracts the cure. (2.) When the divided parts are thickened and inflamed. (3.) When the wound is complicated by the introduction of a poison, or of some foreign body that cannot be removed.†

CHAPTER II.

OF PUNCTURED WOUNDS.

General Description.—These are justly esteemed the most dangerous of all wounds. (1.) Because from their depth they are liable to implicate blood-vessels, nerves, viscera, and other deep-seated parts of importance. (2.) Because the parts which they traverse are stretched and torn, and consequently are disposed to inflame and suppurate. (3.) Because matter when formed has no free exit, and is liable to burrow extensively. (4.) Because foreign bodies may be carried in to great depths without being suspected, and create long-continued irritation. (5.) Because they are most liable to be followed by tetanus.

Treatment.—The first point usually mooted in discussing the treatment of these wounds is the propriety of dilating them, and converting them into simple incisions, in order to avert the deep-seated suppuration and confinement of matter. But as those evils are incident on the inflammation that supervenes, and as they by no means follow of necessity, an endeavour should be made to prevent or mitigate inflammation, so that there may be no necessity for such a severe measure.

In the first place, therefore, rest, low diet, purgatives, cold lotions, and leeches, must be sedulously employed, to counteract all

* Mr. Wardrop has seen the large surface exposed by the removal of a diseased breast heal completely under a crust of blood in thirty days, without suppuration. Common experience shows that it is better to leave slight scratches and abrasions to heal by themselves in this natural manner, than to interfere with them by plasters or ointments.

† Palmer, note on Hunter, vol. iii. p. 259.

excess of inflammation, and to cause the absorption of any blood that may be effused in the course of the wound;—and perhaps of pus, if formed in very small quantity. But if, notwithstanding, there should be severe pain, and swelling, and fever, a free incision must be made for the relief of tension and the discharge of matter; —and the case must be treated in the same manner as a deep-seated abscess.

DIAGNOSIS.—If the instrument with which a puncture is made be angular, the shape of the wound will in general be the same. But it is a remarkable fact that a punctured wound made with a *circular conical weapon* is not *round* but *linear*, as though it had been made with a narrow, flat instrument. And the direction of the wound varies in different situations;—thus in the neck, in the axilla, and near the linea alba, it is vertical; and on the sides of the abdomen, oblique.

CHAPTER III.

OF LACERATIONS AND CONTUSIONS.

SECTION I.—OF CONTUSION AND ECCHYMOSIS.

DEFINITION.—A contusion signifies an injury inflicted by some obtuse, blunt object, without perforation of the skin.

CONSEQUENCES.—The consequences of contusion are, (1) a degree of *concussion*, or benumbing, which may be pretty severe, without much further mischief; (2) some *structural injury*, which will be followed by inflammation. The degrees of this structural injury are three.

1. There may be *rupture of the smaller vessels*, the blood from which infiltrates the cellular tissue, and causes an ordinary *ecchymosis.*

2. A *large vessel* may be ruptured, so that blood is effused in considerable quantity, and tears up the cellular tissue, forming a cavity.

3. The tissues may be irretrievably pulpified and *disorganised.*

ECCHYMOSIS.—When ecchymosis has been produced in the skin, or immediately beneath it, there appears a swelling of a reddish colour, which speedily becomes black. On the third day it is violet, and the margin, which was at first well defined, is found to be faint and diffused. About the fifth or sixth day the colour becomes green; on the seventh or eighth, yellow; and it gradually disappears about the tenth or twelfth;—sooner or later according to the vigour of the individual and the quantity of the blood effused.

If an ecchymosis be formed in the cellular tissue without injury of the skin, no discoloration may appear for twenty-four hours;—and if it be more deeply seated among the muscles, it will not affect the skin for some days, and may then appear at a part quite remote from the seat of the injury;—and in this last case will usually be in the form of irregular yellow spots, marbled with green and blue.*

Causes.—Ecchymosis may be produced by many other causes besides contusions. It is a symptom of certain diseases, as scurvy, purpura, and the last stage of fevers. It may be a consequence of oblique wounds, which do not permit the blood to flow freely out;—of spasms, and other violent contractions of the muscles;—it may also be caused by suction, (as after leech-bites,) especially in a part where the skin is thin. It may further be simulated by the application of colouring matters to the skin. Lastly, ecchymosis produced during life may require to be distinguished from various appearances arising after death.

Diagnosis.—Ecchymosis produced by suction may be distinguished from that which is the result of injury, by being generally in the form of small round spots, and situated on the inside of the arms, or female breasts; and the surgeon required to decide on the cause of such marks should consider whether they correspond in their appearance to the date which is assigned to them.

Artificial discoloration of the skin may be distinguished from ecchymosis by its being generally in round or irregular spots, fringed at the edges.†

Treatment.—The indications are, (1) to check extravasation of blood; (2) to prevent inflammation; (3) to produce absorption of the fluids, and restore the use of the parts.

If the patient be robust, and the bruise seated on the head or trunk;—or if it be extensive elsewhere, and the swelling increase rapidly, and become very tense, it will be expedient to bleed. The bruised part should, if possible, be elevated;—and cold water, or brandy, or the white of an egg curdled with alum, or water rendered cold by dissolving a considerable quantity of saline matter in it, should be liberally applied at once;—and a sufficient number of leeches, as soon as there are any signs of inflammatory pain and swelling, but not before. These measures, together with pur-

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* Devergie, Medicine Legale. Paris, 1836, tome ii. p. 57.

† Fallot relates the case of a girl who yielded to the solicitations of her lover, and then made a number of black marks on her thighs and body, and pretended to her parents that she had been forcibly deflowered. He could neither ascertain the composition of the pigment used, nor remove its effects, although the deception was apparent enough. De la Simulation et de la Dissimulation des Maladies. Bruxelles, 1836, p. 67.

gatives and low diet, will suffice for the two first indications;—whilst the third will be fulfilled by friction with stimulating liniments; by cold or hot affusion; and passive motion after inflammation has subsided. Sometimes, however, the effusion of blood increases very fast, and the tumour becomes tense and shining, so as to threaten rupture of the skin. It will be well in this case to imitate the practice of prize-fighters, and make a very small aperture with the point of a lancet, and let as much blood be sucked out as can be without difficulty; although this should not be done unless absolutely necessary, because the pressure of the blood already effused tends to prevent the escape of more. If, however, this cannot be done, because the blood has coagulated,—and if the skin is so tense that it will inevitably either burst or slough,—and if the pain and tension are not adequately relieved by the free employment of antiphlogistic measures, so that the clot, instead of being absorbed, will be removed by suppuration,—an incision of sufficient length should be made into the swelling, and a poultice be applied. Then the clot will most likely be gradually extruded by the contraction of the cavity, and a simple granulating wound will be left. But it is very bad practice to squeeze or scoop out the coagulum, as the bleeding might be brought on afresh, and severe inflammation be excited.*

If an artery of considerable size be lacerated, which will be known by the situation of the contusion and the great and rapid swelling, the case becomes a *diffused aneurism*, and must be treated accordingly.

If the skin be so much injured as to endanger sloughing, tepid applications are to be preferred, especially that of poppy fomentation and spirit of wine.

If the finger or toes have been severely bruised, so that it may seem impossible to save them, they should not be too hastily amputated, as they often recover under unfavourable circumstances.

If any superficial part have been killed by injury, the tepid water-dressing or a poultice will be the best and most convenient application till the slough separates. But should violent inflammation or gangrene come on, they must be treated as has already been directed.

If any bruise be attended with severe collapse, the measures described in Part I., Chap. I., must be adopted. In no case should cold be applied extensively to the trunk; extensive superficial extravasation (to counteract which it was recommended above) rarely occurs there;—and if there be extravasation into the cavities, it must be combated by bleeding.

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* Hunter on the Blood, p. ii. chap. ii. sect. i.

SECTION II.—OF LACERATED AND CONTUSED WOUNDS.

GENERAL DESCRIPTION.—These wounds are attended with less hæmorrhage than the incised;—both because their surface, being irregular, renders it easy for the blood to adhere and coagulate;—and because arteries, when torn, do not bleed so much as when cut. But in all other respects they are infinitely more serious. (1) They are liable to inflame violently and slough; (2) they are often complicated with foreign bodies; and (3) they are more liable than simple wounds to occasion severe constitutional disturbance and tetanus.

TREATMENT.—In the first place, bleeding must be restrained;—secondly, foreign bodies must be removed;—thirdly, the divided parts must be brought into apposition, in case the whole or any part of them may be inclined to unite by adhesion. But as this is not very likely to occur, and as the wound mostly inflames highly and suppurates, there should be no straining with plasters or tight bandages. Then the patient must observe rest and low diet, and be purged;—and a cloth dipped in cold water;—or a soft poultice;—or the water-dressing, or a poppy fomentation, with or without spirit of wine, may be applied locally, according to his feelings. Cold must not be applied too extensively, especially if the injury be seated on the trunk, or be very severe, or if much blood has been lost, or the patient be very old, or young, or feeble.

When pain and inflammation appear, bleeding may be performed, if the injury be important enough to require it, and the patient's strength can bear it; otherwise leeches should be applied. But the patient must not be reduced too much, or tetanus will be more liable to come on. Openings are to be made if necessary, in order to prevent the lodgment of putrid blood in the early stages, and of matter subsequently. When sloughs have separated, and suppuration is kindly established, the parts should be brought into apposition, as much as can be done without leaving sinuses, and the case must then be treated as an ordinary sore.

CHAPTER IV.

OF GUNSHOT WOUNDS.

DEFINITION.—Under the term *gunshot wounds* are included all the injuries caused by the discharge or bursting of firearms. They consist of "severe contusions, with or without solution of continuity."

SYMPTOMS.—When a musket or pistol ball has penetrated an ordinary fleshy part, there is seen a hole, perhaps rather smaller than the ball itself, with a livid *inverted* margin;—and if the ball have passed completely through, there will be another and a more ragged orifice, with its edge *everted*. The wound will, besides, be attended with more or less *pain*, *hæmorrhage*, and *constitutional disturbance*.

(*a*) The *pain* in these cases is said, by most authors, to be inconsiderable at the moment of infliction. Mr. Guthrie, however, both from observation and personal experience, affirms that this is by no means the case, and says that in general the pain is severe;—that it is a dead, heavy, painful blow;—although still the injury may not be felt at the moment, if it is inflicted while the patient's whole attention is absorbed by other objects.

(*b*) Most authors state that gunshot wounds are attended with very little *hæmorrhage*, unless some considerable blood-vessel has been divided. But Mr. Guthrie asserts that this is equally erroneous; that there is in general considerable hæmorrhage of an arterial colour; but that a wound of a large artery is only to be feared if the blood continue to be poured out in great quantity, and *per saltum*, in spite of pressure.

(*c*) The *constitutional disturbance* accompanying these wounds is severe and peculiar. The surface is pale, and bedewed with cold perspiration;—every limb trembles; the patient cannot stand without support; there are vomiting and faintness,—and peculiar alarm, anxiety, and confusion of the mind. The severity of these symptoms will, in general, be proportionate to the extent of the injury, the importance of the part wounded, and the habitual fortitude of the sufferer; but the aneccote related in the adjoining note will show that they may be most severe under circumstances the most trivial.*

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* During a rapid advance of part of the British army in Portugal, "one of the skirmishers suddenly came upon his adversary, with only a small bank between them; both parties presented, the muzzles of the pieces nearly touching; both fired, and both fell. The British soldier, after a minute or two, thinking himself hit, but still finding himself capable of moving, got up, and found his adversary dead on the other side of the bank. "I saw him," says Mr. Guthrie, "immediately afterwards in considerable alarm, being conscious of a blow somewhere, but which, after a diligent search, proved to be only a graze from a ball on the ulnar side of the arm; yet the certainty he was in of being killed, from the respective positions of the parties, had such an effect upon him at the moment of receiving this trifling injury, as nearly to deprive him for a short time of his powers of volition: whereas, had the

Course of Balls. — A remarkable circumstance connected with gunshot wounds is the facility with which the ball may be diverted from its course by the slightest obstacles. Any trifling obliquity of surface, or difference of density in the parts which it traverses, may cause it to take a most circuitous route. Thus a ball may enter on one side of the head, chest, or abdomen, and may pass out at a point exactly opposite, just as if it had gone entirely through the cavity, whereas it may be found to have travelled round beneath the skin. Sometimes it will make a complete circuit, as in the case of a friend of Dr. Hennen, who was struck about the *pomum Adami* by a bullet, which passed completely round the neck, and was found lying in the very orifice by which it entered. The track of the ball will often be indicated in those cases by a blush, or dusky red line, or wheal on the skin, or sometimes by a peculiar emphysematous crackling;—and the diagnosis will of course be aided by the presence or absence of the symptoms of wounds of the great cavities. In a similar manner balls will run along concave surfaces. Thus a soldier may be struck on the wrist when the arm is bent in the act of firing, and the ball may graze along the arm, and fly off at the shoulder; or a ball may strike the outside of the calf of a mounted officer, and be thrown up into the popliteal space; or one may enter the thorax or abdomen, glide along the inner surface of the peritonæum or pleura, and pass out or be lodged near the spine.

Lodgment of Balls. — It is always important to ascertain whether the shot have passed out of the body, or whether it is lodged;—and supposing that there are two holes, it must be considered whether they are produced by the *entrance* and *exit of one*, or by the *entrance of two* distinct balls. If there are two holes, and they are distant from each other, some light may be thrown on the question by ascertaining the position of the patient at the time he was wounded, and the posture of his assailant. Thus a soldier has presented himself with two shot-holes, one on the outside of the ankle, the other near the trochanter. But they were both caused by the same ball, which entered at the ankle when the foot was raised in the act of running.* In another instance, a soldier, who was ascending a scaling-ladder, was wounded in the right arm, and the ball was found under the skin of the opposite thigh.† But even though there may be only one opening, it by no means follows that the ball has lodged; for it may have escaped by the very hole at which it entered, after having made the circuit of the body, as in the case of Dr. Hennen's friend just men-

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wound been received from a concealed or distant enemy, it would in all probability have been little noticed." Guthrie, op. cit. p. 11.

* Guthrie, op. cit., p. 17. † Hennen, op. cit., p. 35.

tioned. Or it may have impinged against some part, such as the cartilage of a rib, which has caused it to recoil; and a ball has been known to drive a piece of bone into the brain, and fall out of the wound afterwards. In some instances a ball has carried a fold of linen for the distance of one, or even three or four inches into the wound; and on drawing this out, the ball of course comes out with it.

Again, it is very possible that two balls may enter by the same aperture, one of which may pass out, and the other diverge and wound some important organ. So that, in many cases, the prognosis should be guarded, especially if the state of constitutional alarm and depression, instead of diminishing, increase considerably, and disproportionately to the apparent extent of the injury. Sometimes it will happen that a ball splits, either from a defect in the casting, or from its striking against some sharp bony ridge, as the vomer or shin.*

But it frequently happens that large masses of metal are impacted in the substance of a part without much external indication of their presence, it appearing as though they made room for themselves by compressing the surrounding soft parts.†

Foreign Bodies.—Gunshot wounds may be complicated by the presence of other foreign bodies besides the ball; and these are divided by Dr. Hennen into two classes; namely, 1st, pieces of the clothing, or of matters contained in the pockets, or portions of the

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* A Brunswick soldier at Waterloo "was struck by a musket ball on the tip of the nose, which split upon the bony edge where joined by the cartilage. A piece of the ball was extracted on the spot, and it was supposed that the ball itself had been purposely cut into pieces, as is sometimes done by foreign riflemen. The cure went on without accident until the tenth day, when the man was seized with a violent hæmorrhage from the nose and mouth, which came on suddenly, and carried him off in the course of the night. On dissection, it appeared that a very minute portion of the ball had penetrated along the basis of the scull, lodged in the sinus of the left internal jugular vein, forming a sort of sac for itself close upon the vein, and which having inflamed the coats of the vessel, they at last ulcerated and burst." Hennen, op. cit., p. 91.

† Hennen relates the case of a young officer who was killed at the siege of Seringapatam by a cannon-ball of thirty-two pounds, which completely buried itself in the muscles of his hip. A mass of grape-shot, the size of the closed fist, has been extracted from under the plantar aponeurosis. Guthrie gives a case in which a ball of eight pounds weight lodged in the thigh without making a large opening, and was not discovered till it accidentally rolled out on amputating the limb.

body of some unfortunate comrade;* 2ndly, pieces of bone or muscle belonging to the individual, but which have become virtually extraneous, in consequence of being dead and detached. These are infinitely more mischievous than the former.

SPENT BALLS. — Injuries from spent balls have at all times attracted great attention, from the extreme violence of the injury inflicted, with very little external appearance of it. In some rare cases a cannon-ball has passed close to the head, and has caused death, either immediately or within a few hours, without leaving any morbid appearance that could be detected by dissection.† But in the majority of instances it is found, that although the skin may be intact, or but trivially grazed, still that the parts beneath have been irreparably disorganised;—the muscles pulpified, the bones comminuted, and large vessels and nerves torn across. The patient is severely stunned; and the part injured is motionless, and senseless, and benumbed for some distance. Swelling soon comes on, but more from extravasation than from inflammation, which, although attempted to be set up, never attains any height. Gangrene occurs speedily, and is propagated to the neighbouring parts, weakened as they are by participation in the injury, and by their contact with tissues that have ceased to live.

These cases were formerly called *wind contusions*, being

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* A pocket of coarse linen, containing two five franc pieces and two copper coins, have been extracted after some days from the vastus externus muscle, in which they were deeply imbedded. Three pieces of coin were extracted on the fifth day after the battle of Waterloo, from a wound in the thigh of a poor Hanoverian soldier. As he possessed neither money nor pocket to put it into, they evidently came from a comrade who stood before him, and who was killed by the same shot. Part of the cranium has been found imbedded in the thigh;—a tooth in the temporal muscle,—and the olecranon of one man in the bend of another man's elbow.

† A lad was carrying a sand-bag on his head, when it was struck by a twenty-four pound shot from a distant battery. He immediately fell, senseless and comatose, with a slow, weak pulse, labouring respiration without stertor, and incessant attempts to vomit. The pupil of the eye was dilated and motionless, that of the other natural; the hair along the sagittal suture was erect, resembling that of a person placed on the insulating stool and electrified. In this state he remained for twenty-four hours, and then expired in convulsions. No cause of death was discovered on a minute examination, so that it must be attributed to a violent concussion; but it is remarkable that the ball should cause such a concussion, without also causing some more palpable lesion. Hennen, p. 96.

ascribed to a compression and displacement of the air by the ball. Some later theorists have conceived that they are produced by a current of electricity, which it generates in its passage through the atmosphere;—and others have imagined that a vacuum is formed behind it, and that the dreadful consequences we have enumerated arise from the eagerness of the living tissues to start from their places to fill up this vacuum. If, however, as these theorists assume, a ball can produce such effects merely by passing *near* the body, and without actually *touching*, it must, *à fortiori*, produce them, when it indubitably touches;—as when a leg is knocked off;—but this is not the case. The subjoined quotation from Baron Larrey offers the most probable explanation of the phenomenon.*

PROGRESS AND CONSEQUENCES.—*In favourable cases.*—Inflammation generally comes on in from twelve to twenty-four hours after a gunshot wound of some common part. The wound becomes swelled, stiff, and painful, and exudes a little reddish serum. On the third or fourth day pus begins to be formed; but the suppuration is limited by the effusion of lymph around the wound. About the fifth day the parts in the immediate track of the ball, which have been killed by the violence of the contusion, begin to separate, and change from a blackish red to a brownish yellow colour;—and on the tenth or fifteenth day, sooner or later, according to the vigour of the constitution, the slough is thrown off.† In the mean

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* "A cannon-ball is propelled at first with a rectilinear movement; and if, during this part of its course, it strikes against any part of the human body, it carries it away; but the ball, after having traversed a certain distance, undergoes some change in motion, in consequence of the resistance of the atmosphere and the attraction of the earth, and turns on its own axis, in addition to the direct impulse received from the explosion of the powder. If it should strike any part of the body when the velocity with which the ball is passing is greatly diminished, it does not carry it away, as in the preceding case; but, in consequence of its curvilinear or rolling motion, it turns round the part, in the same manner as a wheel passes over a limb, instead of forcing a passage through it. The soft elastic parts, such as the skin and cellular membrane, yield, whilst the bones, muscles, tendons, arteries, &c., offering a greater degree of resistance, are either bruised or ruptured. If the ball should strike one of the cavities of the body, the viscera suffer in like manner." Mem. de Chir. Mil. quoted in Guthrie, op. cit.

† It is by no means true, as is generally stated, that the whole track of the ball must slough, for the separated parts are never equal in extent to the depth of the wound. Guthrie.

time granulations form, the wound contracts and becomes impervious at its centre, and generally heals with a depressed cicatrix by the end of six weeks or two months,—the lower aperture always healing first. These are the symptoms observed in healthy constitutions, and they will be attended with little constitutional disturbance, and that of no long duration.

Inflammatory Complication.—But if the patient, previously to the receipt of his wound, or after it, has committed excesses, or has been exposed to vicissitudes of temperature;—or if the wound has been irritated by want of rest, or improper applications, the local and constitutional affections will be much more formidable. The pain will be more severe, the redness and swelling more extensive;—the wound secretes no serum; and there is violent inflammatory fever. When suppuration is established, instead of being confined to the track of the ball, it is diffused amongst the neighbouring muscles and under fasciæ, forming numerous and irregular sinuses;—so that the treatment is protracted for many months; and even after the cure is completed, the limb remains disabled by contractions and adhesions of the muscles, and is liable to œdematous swellings from the structural and vital weakness which a continuance of inflammation always induces.

Lodgment of Foreign Bodies.—If the ball or any other foreign body remain lodged, the present inflammation and constitutional disturbance will be proportionably more severe, and the resulting suppuration more profuse and exhausting; and it will besides be accompanied with more or less pain, till the exciting cause is got rid of. But if the constitution or parts do not possess much irritability; if the ball be small and polished, and if it press against no nerves, or vessels, or other sensitive parts, it may, and often does, remain for years without creating any disturbance—a cyst being formed for it in the belly of the muscle, or in the interstitial cellular tissue. And this is much more likely to happen if the force with which it was propelled was *not very great*;—because, in that case, the wound is formed rather by *penetration* than by *contusion*, and it may close by adhesion, with very little suppuration or separation of sloughs.

Rare Complications.—Mr. Guthrie has described two rare and peculiarly fatal forms of inflammation occasionally supervening on gunshot wounds. The *first* is a most acute inflammation, attacking the muscles and other deep-seated parts, with very little affection of the skin. In the instances related, the wounds were apparently going on well, when they became extremely painful towards evening; the pain increased during the night, and death occurred before morning. On dissection, says the learned author, the whole limb "seemed so stuffed or gorged with blood, that the texture of the parts, muscular as well as cellular, was soft, and readily giving way to a moderate pressure with the fingers. I can

only compare it to the appearance of a part just falling into a state of gangrene.*

The *second* variety made its appearance after the first two days, and in every case which Mr. G. saw, the wound was in the upper extremity. The part swelled, and was rather œdematous, and affected with a burning pain; the skin was bright and glossy. In fatal cases, the swelling rapidly extended up to the axilla, and then difficulty of breathing came on, and was soon followed by death. One patient only, out of six, was saved, by the most vigorous antiphlogistic treatment. The first three cases were not inspected p. m.; in the fourth, the great veins were inflamed, and in the fifth there was effusion into the chest.

Mortification supervening on gunshot wounds may occur under the following conditions:—(1.) When the injured parts are irrecoverably disorganised, so that they immediately cease to live; which happens to the tissues in the immediate track of a musket-ball, or to a whole limb struck by a spent shot. (2.) From excess of inflammation following a wound;—either because the action induced is too great to be borne by the weakened powers of the part;—or because the excess of inflammation is due to a disordered state of the constitution. (3.) From division of the great arterial and venous trunks. This is indicated by its commencing in the extremity of the limb; the foot or the hand for instance; and it presents a combination of the two forms of dry and humid gangrene. The most distant parts become cold, pale, and insensible; this state spreads up the limb; then the patient complains of pain and numbness; and the parts above those which are actually dead become slightly tumefied and discoloured. In the course of three or four days heat and redness supervene, and the swelling greatly increases. The constitution now becomes affected with restlessness, anxiety, and fever;—the swelling rapidly increases, with great pain, the skin being yellowish and streaked with bluish lines. The patient mostly sinks;—there being but few cases in which, if the first stage has passed by, and the constitution has become affected, (as indicated by the rapid extension of the gangrenous swelling,) there will be power to arrest the disease, and form a line of separation.

Secondary Hæmorrhage.—This is the last complication of gunshot wounds that will here require notice. It may occur, (1.) In consequence of excessive arterial action, by which the coagula in the mouths of the divided vessels are displaced. This may occur at any time from the first day till the fifth. (2.) From separation of a slough from a large artery. This may occur from the fifth till the twentieth day; and it is this peculiar variety of

* Op. cit., p. 97.

secondary hæmorrhage which is generally thought to be so frequent in its occurrence, but which Mr. Guthrie asserts not to happen in more than three or four out of a thousand cases. (3.) From ulceration of the coats of an artery; and this may happen at any time until the wound is healed. (4.) The most common variety is a real *inflammatory hæmorrhage;* the blood not being poured out from any particular trunk, but exuding from the general surface of a granulating wound. This kind of hæmorrhage is accordingly caused by everything capable of exciting the circulation;—by excess in food, drink, or muscular exertion, and particularly by venery;* and the same causes will, of course, tend greatly to induce either of the other varieties. It is most liable to occur in persons of a sanguine temperament;—and, according to Mr. Guthrie, especially if they have been exposed to the close air of a crowded hospital. The hæmorrhage is preceded in these cases (and in the other varieties also, if partially induced by the same causes) by pain, heat, and throbbing of the wound.†

TREATMENT OF GUNSHOT WOUNDS.

Of Simple Cases.—When a ball has passed completely through some common fleshy part, such as the thigh or buttock, the wound should be sponged clean;—and when the ordinary hæmorrhage is arrested, the best application is a piece of lint, (which may or may not be dipped in oil,) and which should be secured by two or three cross strips of plaster. Tremor and mental confusion may be allayed by a mouthful of wine or spirits, and by a few consolatory words from the surgeon;—or, if severe, by an opiate. When they have subsided, a compress wetted with cold water, or with some innocent lotion, will be the only other application needed. If the patient can be kept at rest in bed, all bandages, at this stage, will be unnecessary and injurious. In military practice, one or two turns of a roller may be necessary to

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* The tendency of the great excitement produced by the venereal orgasm to cause hæmorrhage is well known. Hennen (p. 189) enumerates three cases; in the first of which, fatal hæmorrhage from the lungs took place from this cause; in the second, "an officer died of uncontrollable bleeding from an amputated arm, from the same;" in the third, "a young officer with an amputated thigh, which was healed within half an inch, had, seven weeks after the amputation, an hæmorrhage so violent from an excess of this nature, and a subsequent opening up of the stump to such an extent, as detained him under cure for three months longer." Instances of death in coitu are mostly to be assigned to a like cause.

† Op. cit., p. 304.

keep on the dressings, but they should not be applied with any degree of tightness;—and as a general rule, their application on the field of battle should be as limited as possible, lest there be a deficiency of them in the later stages of treatment, when they can scarcely be dispensed with.

These primary dressings need not be removed for the first three or four days; and if they have become dry and stiff, they should be well moistened with warm water previous to their removal. During the succeeding inflammatory stage, there is the choice of hot or cold applications, each of which has its advocates. Mr. Guthrie greatly prefers the use of cold water;—but if it make the patient feel chilly or uncomfortable, or if it augment stiffness and pain, warm poultices should be substituted. But it is found that the too frequent use of poultices weakens parts, and renders them incapable of the necessary restorative actions; whilst they too often serve as a cloak for negligence, and prevent the adoption of more active measures;—in fact, the experienced military surgeon just quoted considers a poultice applied to a compound fracture, or wounded joint, as the sure precursor of amputation.* When suppuration is well established, the cure is to be completed by mild stimulating lotions, and bandages. Particular care must be taken to prevent sinuses, by pressing out all stagnant matter, and preventing its accumulation by compresses; or by free openings, if requisite, to insure its discharge. Gentle frictions, and passive motion, are the best means for preventing or removing subsequent stiffness. The *constitutional treatment* must be antiphlogistic. If inflammation be slight, purging, low diet, and rest may suffice;—but if it be severe, and the patient robust, bleeding may be employed freely.† A combination of magnesiæ sulphas and tartar emetic is a most convenient form for the military surgeon. *Leeches* may be applied to allay inflammation. *Opiates* should be given at bedtime, if there be much spasmodic twitching and pain.

Superficial wounds, made by musket or cannon balls, are to be treated in the same way. It must be recollected that cold lotions are never to be extensively applied to the trunk.

Dilatation.—The same observations are to be made concerning the dilatation of gunshot, as of punctured wounds. Scarifications or incisions are never to be made from routine, nor without some

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* They were recommended by Hunter, on the plea that it is expedient to promote suppuration; whereas it is a great object to have as little suppuration as possible.

† Soldiers, from their generous diet, active exercise, and regular discipline, bear depletions of every kind much better than rustic labourers or mechanics, although, perhaps, more ruddy and healthful in appearance.

definite object.* But if there be great swelling of muscular parts confined by fasciæ, or if matter form in the same, there can be no doubt of the propriety of a sufficiently long and deep incision to relieve the tension and discharge the matter. Dilatation may also be required in compound gunshot fracture, to remove splinters of bone.

The two peculiarly fatal forms of inflammation specified by Mr. Guthrie are to be combated by vigorous antiphlogistic measures and incisions.

Foreign Bodies.—In *every case* the surgeon should ascertain whether foreign bodies are lodged in the wound; for even although it may be satisfactorily demonstrated that the *ball* has passed out, —or although there may be a mere laceration from grapeshot or shell, still pieces of the clothing or other matters may remain in the wound. If there be only one opening, such an examination is indispensable. The parts should be put as much as possible into the posture they were in when the injury was received; and the finger should be passed in as far as it will reach, counter-pressure being at the same time made on the opposite side of the limb. In unimportant parts, the finger may be aided by a long probe or bougie.

If the foreign body is found lying under the skin, it should be immediately removed by an incision, which will require to be larger than at first would be imagined. Pressure should be made to prevent the ball shifting its place during the incision, otherwise the operation will be long and vexatious. If the foreign body is near the wound, it should be removed by forceps, the simpler the better. The orifice will mostly require to be dilated for this purpose, because from the natural elasticity of the skin, and the ensuing tumefaction, it will be too much contracted to allow it to repass.

It is a well-established rule, that on no account are incisions to be made for the removal of foreign bodies, unless they are certain of being successful; both because of the needless pain and suppuration created, and because of the depressing effects of a failure on the patient's mind. If a ball is lodged in the middle of the thigh or other thick fleshy part, and from the direction of the wound it cannot be extracted without a very considerable incision, it should be left to itself;—and it will probably be either brought within reach by the natural contraction of the parts, and by the flow of matter—or it may become encysted, and give no further trouble. Bullets that have become encysted are to be cut out, if they come

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* Yet we read of the orifices of these wounds being scored in a radiated manner by foreign surgeons, as though in compliance with some religious ordinance. Sir C. Bell's Dissertation of Gunshot Wounds, p. 459.

near the skin, or if, during any of their extraordinary changes of position, they impede the functions of any important part, otherwise they are to be left to themselves. The cyst that envelopes them is frequently so dense, and adheres so firmly, that a portion of it must be removed at the same time.

If a ball has lodged in the substance of a bone, it should be removed by a chisel, or trephine; otherwise caries, or necrosis, and so much mischief as to necessitate amputation, may follow. In a few rare cases, however, balls have remained imbedded in bone, without mischief.

SECONDARY HÆMORRHAGE.—The *fourth* of the varieties of secondary hæmorrhage is to be treated by rest; by the application of cold or iced water, or ice itself;—by pressure on the bleeding surface, or on the arterial trunks above;—and if the blood seem to ooze from any particular spot, it may be touched with a styptic. (Arg. Nitras.) If there be fever and plethora, bleeding and purging; if weakness and irritability, tonics, opiates, and the mineral acids;—and, in all cases, removal from a crowded hospital will be expedient.

NECESSITY OF AMPUTATION.—It will not be wondered at, that this operation will be frequently required in gunshot injuries of the limbs, on account of the fracture and comminution of bones, the exposure of joints, the division of blood-vessels, and the irreparable violence inflicted on the skin and soft parts.

The points for consideration in determining its necessity are twofold:—viz. 1st, Would the preservation of the limb endanger the patient's life?—and 2ndly, supposing that it would not, would the limb be of use, if saved? In deciding on the first point, we must be guided by the patient's *age*;—for an old person would succumb to an injury that a young one might recover from;—by his *habits*;—for temperance, sobriety, and a well-disciplined mind, will be greatly in his favour;—by *previous disease*;—for (as has already been insisted on)* if there be organic disease of any viscus, the patient will be infinitely more liable to sink;—lastly, by the *supply of necessaries*, and extent of accommodation;—hence, in compound fractures, and other cases demanding perfect quiescence, many more limbs may be saved in civil practice than in the accidents of naval and military warfare.

PRIMARY OR SECONDARY?—But supposing amputation to be decidedly required;—that the limb, if preserved, can be but a burthen to the patient;—and that the attempt to preserve it would endanger his life;—the question next arises, whether amputation ought to be *primary*;—that is, performed within the first forty-eight hours, before fever and inflammation have set in;—or whether it ought to be *secondary*;—that is, delayed till inflammation has

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* Part I. chap. i.

subsided, and suppuration is established;—which is not generally the case in less than from three to six weeks.

The advocates of secondary amputation support their practice by the following arguments. They say that persons in a rude state of health do not by any means bear amputation so well as those who have been labouring under some chronic suppurating complaint of the part to be removed. They allege further, that the surgical operation is a violence superadded to the original injury; and that "if the patient is not able to support the inflammation arising from the accident, it is more than probable that he would not be able to support the amputation and its consequences."*

These arguments, however, might be completely refuted by the consideration that many will necessarily die of the inflammation of an extensive lacerated and contused wound, who would not die of the minor inflammation arising from a clean incision;—and that many will die of secondary amputation, when exhausted by suffering, and weakened by confinement in an hospital, who might have survived a primary operation. Let argument, however, be as it may, there is no appeal from facts. Mr. Guthrie states the comparative loss after secondary and primary operations as follows:—

	Secondary.	*Primary.*
Upper extremities . .	12 deaths to	1
Lower extremities . . .	3 deaths to	1

In another place he says, "Suppose two men have each a knee shattered by a cannon or grape shot, without destroying either the circulation or the connexion of the limb, but in such a manner as to render amputation necessary. Of these, eight shall be amputated on the field of battle, and eight delayed for amputation when the first inflammation has subsided, and suppuration duly established. Of the first eight amputated on the spot, or within twenty-four hours after the injury, I assert from my general experience, that on the average of three trials, six would recover; and from the same source I affirm, that of the eight delayed cases, not one half would live to the proper period of performing the operation; and of the four recovering, not more than two would ultimately recover after amputation."†

Whilst then every endeavour should be made, both in civil and military practice, to avoid mutilation as much as possible, and to preserve a limb if it can be done with safety to life, and if, when cured, it would be useful,—still it must be remembered that (in the words of Hennen) "the sum of human misery will be most materially lessened by permitting no ambiguous case to be subjected to the trial of preserving the limb; constitution, convenience

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* Hunter on Gunshot Wounds.

† Op. cit., p. 224.

for treatment, and local circumstances, having their full weight in the decision."

When amputation is decided upon, it should then be primary. But there are two errors as to time, that even here must be avoided. The first is, that of *amputating too soon*, before the patient is in any measure recovered from the immediate shock, and collapse; the second is, that of *waiting too long*, so that he becomes exhausted by pain. Therefore, when the patient is brought to the surgeon with a limb knocked off, and with a low pulse, cold skin, hiccup, fainting, or other symptoms of extreme collapse, the first endeavour should be to comfort him; to explain the nature of his loss; to assure him of his safety, and to administer small quantities of wine or cordials, and apply warmth; at the same time providing by the tourniquet against immediate peril from bleeding. And in this way, by waiting an hour or two, the agitation of mind and body will be appeased, and the operation may be proceeded to without further delay. But if the pain be so intolerable that the patient eagerly demands to be relieved from his sufferings, the request should be immediately complied with; for the shock of the operation will be infinitely less detrimental than the endurance of such torments.

Care should always be taken, before amputating, to *ascertain the whole amount of injury;* for it would be of little use to cut off a leg, if the patient were shot through the liver.

If, from any unavoidable circumstances, the favourable period has elapsed, and violent fever and inflammation have set in, still the operation must be done without delay in some few cases, to give the patient a chance of surviving. But, in the majority, free antiphlogistic measures should be first employed; and then "On the very day," says Hennen, "that a subsidence of fever is effectually announced by a free and healthy suppuration, by the abatement of local inflammation; by a restoration of the skin to its functions, demonstrated by returning coolness and elasticity, particularly on the affected limb; we should proceed to perform our amputation on those patients in whom no hope of an ultimate recovery without it can be entertained."*

Cases requiring Amputation.—1. The first of these is, when a limb has been completely knocked off by a cannon-ball; and if the bones be splintered and shattered up to the next joint, or if the wound be so near the joint that mischief is to be apprehended, the operation must be performed above it.

2. Extensive injuries of the joints, especially the knee, ankle, or elbow.

3. Compound fractures close to the joints; especially if vessels and nerves be also lacerated, or the bone be much comminuted, or the femur be the injured bone.

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* Op. cit., p. 256.

4. Extensive loss of substance or disorganisation of the soft parts, with or without fracture; as from spent balls, &c.

5. Where the main artery is wounded, and gangrene is commencing, and spreading beyond the toes or fingers; here it should be performed just above the level of the wound.

CHAPTER V.

OF THE EFFECTS OF HEAT, BURNS, AND SCALDS.

General Description.—The distinction between scalds and burns refers only to the difference in the agent through which the heat was applied; although, by some, the term *scald* is used to signify any minor degree of burn that has not produced disorganisation. When the injury has been inflicted through the medium of a fluid, it is generally diffused in its extent, and equable in its severity. It is also generally superficial;—the death of the cutis being rarely caused by the heat of boiling water, unless from continued immersion; although that effect may be readily produced by boiling soap or oil, or other liquids whose point of ebullition is high.

The degree of heat which may be borne without inconvenience or injury, depends on the manner in which it is applied. The body may be exposed to *air* of a temperature of nearly 300° F. without injury, whereas the contact of a *solid* or *fluid* of the same heat would instantly cause burning. Again, some parts of the body will from habit tolerate a degree of heat that would be extremely painful to others."*

Diagnosis.—It is sometimes important in medico-legal investigations, to determine exactly the medium by which a burn has been inflicted. Those caused by some sudden and intense heat of short duration,—as by the ignition of turpentine or gunpowder, or the inflammable gases, are more diffused, uniform, and regular than those occasioned by the contact of heated substances;—and all the hair is burned off smoothly.

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* "Those smiths who are daily employed in making of anchors, have the palms of their hands extremely hard and insensible like horn, insomuch that they are capable of holding burning coals, or even hot iron from the furnace, without danger; but the same smiths, when they lie sleeping by the fireside after they have been tired by their day's labour, have the skin of their legs often burnt and raised into a blister by a small particle of such fire."—Van Swieten Comment., quoted in Kentish's First Essay on Burns.

After burns from the explosion of gunpowder, the injured parts are said to be of a peculiar bluish white. The irritation of these injuries is often aggravated by the numerous grains of gunpowder that escape combustion, and are projected with such force as to stick into the skin. In many cases caused by the explosion of gas in coal mines, particles of the coal dust adhere to the skin in the same manner.

DIVISION.—The most useful division of burns, for practical purposes, is the threefold one which has existed from time immemorial, into, 1st, burns producing *mere redness;* 2ndly, those causing *vesication;* 3rdly, those causing *death of the part burned.*

I. The first class are attended with mere superficial inflammation, terminating in resolution, with or without desquamation of the cuticle. The pain is philosophically said to consist of a perpetuation of the original sense of burning.

II. In the second class, there is a higher degree of inflammation, causing the cutis to exude serum and form vesicles. These in trivial cases dry up and heal; but if the injury to the cutis have been sufficient to cause it to suppurate, they will be succeeded by obstinate ulcers. The pain of these burns is much more severe than in the former class, if especially the vesicles have been torn, and the surface of the true skin exposed to the air and the contact of foreign bodies. The formation and increase of vesicles may often be prevented. They generally appear immediately after the accident, although cases are recorded in which they did not rise for three days.

III. The third class of burns are attended with mortification;—either *primarily*, from disorganisation of structure;—or *secondarily*, from excessive inflammation. These are, for obvious reasons, not attended with so much pain as the last class; but in every other respect they are infinitely more serious, and the sores which remain after the separation of the sloughs, are often months or years in healing.

CONSTITUTIONAL SYMPTOMS.—The constitutional symptoms of severe burns are those of great collapse. The surface is pale, the extremities cold, the pulse quick and feeble;—there are violent and repeated shiverings, and the patient often complains most urgently of cold. In some fatal cases these symptoms are soon succeeded by laborious breathing, coma, and death;—in others, dissolution is preceded by a period of imperfect reaction;—delirium, sharp jerking pulse, and the other symptoms indicative of *prostration with excitement.*

PROGNOSIS.—The danger of burns must be estimated by their extent, their severity, their situation, the age and constitution of the patient, and by the symptoms actually present. *Extensive* burns, even of small severity, are always dangerous; and especially if vesication has occurred early, and the cuticle has been stripped off. *Burns on the trunk* are always more dangerous than

those of an equal extent on the extremities; and it need not be said that *infancy* and *old age* will be alike unfavourable. With regard to the *symptoms actually present*, it may be noticed, that although the severe pain, such as is common in burns of the second class, is in itself a source of great danger, from its tendency to exhaust the vital powers, still that it is on the whole a favourable symptom, if the injury be extensive; and that the want of it indicates urgent peril. "The early subsidence of complaint, unwillingness to be disturbed, apathy approaching to stupor, as if the scale of sensibility had shrunk below the point of pain, is invariably a fatal symptom. Constant shivering is an ill omen. The failure of the pulse and consequent coldness of the extremities, with a livid hue of the transparent skin of the cheeks and lips from congestion in the capillaries, drowsiness, with occasional muscular twitchings, are sure prognostics of death." Subsidence of swelling is an equally ominous symptom.

The *periods of danger* in burns are three; 1st, during the first three to five days; from collapse or imperfect reaction; 2ndly, during the sympathetic fever which follows, in which the patient may sink with an affection of the head or chest; *3rdly, during the suppurative stage, in which he may die from the profuse discharge, or from pulmonary consumption induced by it.

MORBID ANATOMY.—A *post mortem* examination readily accounts for the coma and laborious breathing which are such constant symptoms of fatal burns. Congestion and serous effusion are found on the surface and in the ventricles of the brain;—and the air-cells of the lungs are loaded with a thin muco-serous fluid, as in the "*suffocative catarrh of the dying*" of Laennec. The reason of the tendency to congestion in these organs has not been very well explained; although the disorder of the lungs has been attributed to the reciprocity of function existing between it and the skin.

TREATMENT.—The treatment of burns in their early stage has been a matter of great dispute. Some authorities direct them to be treated in the same light as any other injuries which have produced an equal amount of inflammation. Thus, for a slight burn or scald, insufficient to produce any constitutional depression, they recommend the immediate application of cold in any convenient form, and its continuance until pain and inflammation have subsided.

But it had long been a popular practice to pursue a directly contrary method. It was constantly observed, that although the application of cold was most pleasurable, and continued to be so as long as it was employed unremittingly, still that if it were dis-

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* Kentish observes that very many cases prove fatal on the ninth day.

continued for a moment, the pain returned with infinitely greater force. On the other hand, it was found that if heat or other stimulants were applied to the burn, the pain, although aggravated for the moment, shortly subsided, and that permanent ease was obtained much sooner than by the cooling treatment.

MR. KENTISH'S THEORIES.—These beneficial effects of stimulants (which in the ruder periods of science were supposed, as they still are by the vulgar, to depend on a dissipation or extraction of the heat) were, about forty years ago, attempted to be explained by Mr. Kentish of Newcastle. And as this gentleman's opinions have gained considerable celebrity for their ingenuity and practical utility, it will be well to submit a short account of them to the reader.

The principal theory is embodied in the two following postulates.

1st. That "whenever the action of a part has been considerably diminished by withholding an accustomed stimulus, the reapplication of the stimulus so withheld (or of any other, with a view to make up for the deficiency) must be very cautiously administered, until the part is gradually restored to its former healthy action."

2ndly. "That any part of the system having its action increased to a very high degree, must continue to be excited, though in a less degree, either by the stimulus which caused the increased action, or by some other having the nearest similarity to it, until by degrees the extraordinary action subsides into the healthy action of the part."

Having laid down these axioms, Mr. Kentish next assumes that the injurious effects of cold arise from its diminishing action;—and that those of heat depend on its causing an increase of action. He then shows that the treatment of frost-bites, and of burns, ought to be analogous, although reverse. And that, as in the treatment of frost-bite, we first cautiously avoid heat; but apply snow, then cold water, and so on in an ascending series until the part is able to bear an ordinary degree of heat;—that so, in treating burns, we ought at first to avoid cold; but apply a moderate degree of heat, or of some other stimulant, and proceed in a descending series, gradually diminishing the stimulant power of the applications, until the part is restored to its ordinary powers and actions.*

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* To this theory he appended another, which is certainly rather abstruse. He conceived that the actions of the whole body, and those of every individual member of it, ought to be equal and harmonious; and, consequently, that if the actions of one part be diminished, (as he conceived they are in frost-bite,) sedatives ought to be given to diminish the actions of the whole; but that if the actions of a part were increased, (which he assumed was the case in burns,) stimulants should be given to increase the actions

On the merits of this hypothesis the author will not attempt to decide. Some grave writers have pronounced it to be visionary and unintelligible—and it very possibly is so. It would perhaps be a saving of trouble, if the good effects of stimulants in burns were considered as illustrations of the ultimate fact, that inflammations caused by one irritant may often be dispelled by another. But as regards Mr. Kentish's *practice*, every one who has tried it fairly is decided in its favour. And its general adoption would be expedient for the two following reasons.

1st. Because it is universally admitted that slight cases get well quite as quickly under the use of stimulants as of refrigerants.

2ndly. Because of the frightful mischief that would result, if cold were applied to a severe and extensive burn by some medical ignoramus, or by some non-professional person who had seen it used without detriment in trivial cases.

Local Treatment of the First Class.—In slight cases without vesication, the best treatment will be to apply heat, if it can be done conveniently, either by holding the part near a fire, or by dipping it in water of 112°, and continuing this until the burning pain begins to subside; or it may be bathed with tepid oil of turpentine, or alcohol, or æther, and then should be covered up to prevent evaporation. These liquids should be warmed by putting them into a teacup, immersed in boiling water; but if the surgeon prefer the cooling plan, he may apply any evaporating or refrigerant lotion—cold water is as good as many others: pounded ice mixed with lard was recommended by Earle: a poultice of potato or grated turnip is not to be despised; but whatever is used, it must be renewed often enough to keep up the sensation of cold.

Of the Second Class.—If vesications have formed, and they be very tense and full, they should be pricked with a needle, to let a little of the serum exude, and diminish the chance of rupturing them. Then the same stimulant applications should be made use of as were directed in the last case, and the part should be wrapped up in fine linen, to keep it from cold and injury. But if the vesicles have been broken, the part should first be bathed with the tepid turpentine, &c., and then with all possible expedition an ointment or liniment, composed of ung. resinæ. ℥i; and ol. terebinth. ℥ß, should be slightly warmed by the fire, spread thickly on linen or lint, and then be liberally applied so as to cover the whole of the denuded parts, which are, lastly, to be wrapped up warmly.

If the opposite plan of treatment is to be pursued, cold appli-

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of the whole; and therefore he prescribed a dose of brandy, æther, and laudanum, in burns, as soon as possible after the receipt of the injury.

cations may be used, provided the vesicles be unbroken, and the burn not severe and extensive enough to cause constitutional depression. But if the vesicles are broken, a soft unguent of lard and oil should be laid on to protect the cutis.

Of the Third Class.—If any part of the flesh have been destroyed, the primary treatment must be the same as in the last case; and poultices are to be subsequently applied until the sloughs separate.

There need be no haste to remove the first dressings, provided that the patient feel comfortable, and that there is no ill smell. According to Kentish, the turpentine should not be applied more than once, unless it be to expedite the separation of sloughs at a later period; but the *unguentum resinæ* by itself should be used for the second dressing. The surgeon should always take care to have his applications ready, so that the patient may not be for any length of time exposed to the cold.

Constitutional Treatment.—If there be an urgent degree of collapse, the measures directed in Part I. ch. i. are to be diligently adopted. Care should, however, be taken not to push this stimulant plan too far, lest congestion in the head or chest be induced or aggravated;—and, on the other hand, it must not be abandoned too soon, lest the collapse return, as it is very apt to do. Gruel, arrowroot, and other forms of mild nutriment, must be judiciously administered, according to circumstances.

Use of Opium.—If there be much pain, a good dose of opium should be given without delay. For children, nothing can be better than the compound tincture of camphor, of which ʒi—ʒii may be given according to the age. (Each fluid drachm contains ¼ of a grain of opium.) Yet it must be added that certain great authorities altogether condemn its employment. "Opium," says Larrey, "is injurious, whether used externally or internally. Externally it stupifies the parts, instead of exciting them to a salutary inflammation; internally, if used in considerable quantity, it enfeebles all the organs, after producing a momentary stimulation."* Travers objects to it because of its tendency to produce or increase congestion in the head. He says that "in small doses it is inefficacious, and in large ones injurious." Notwithstanding these objections, however, it may be given in moderation when demanded by urgent pain. If there be a tendency to coma, it is of course inadmissible; but then the patient will most probably perish, whether it be given him or not.

During the symptomatic fever, the bowels must be kept open by some mild laxative, such as castor oil or rhubarb; and the diet must be unirritating, although it will not do to make it too low. In the event of any inflammatory or congestive attack of the head

* Mem. de Chir. Mil., t. i. p. 96.

or chest, purgatives, and leeches or bleeding, must be cautiously employed according to the strength.

Treatment of the remaining Ulcers.—The ulcers resulting from burns are very slow in healing. Their granulations are pale and flabby, and the cicatrix extremely liable to contract and become dense, hard, and cartilaginous. Thus the most serious deformities are sometimes occasioned; the chin may be fixed to the breast; the eyelids rendered incapable of closing; or a limb rigidly and immovably bent. The cause of this disinclination to heal is not well understood. Some have attributed it to a specific irritation produced by the heat; but one cause there is which may be easily detected and remedied, namely too full a diet, which is often needlessly used on the plea of supporting the strength under the profuse discharge. "There can be no doubt," says Kentish, "that full diet and stimulants during the suppurative stage, keep up irritation in the system, and cause the immense continued discharge by the exposed surfaces of the wounds."* And it is equally certain that many cases will rapidly get well when the diet is lowered and purgatives are administered. Again, there are some cases that do not heal because irritated by ointments, but which mend under the use of simple poultices.

For the treatment of these ulcers most authors seem to agree that the *cure by scabbing* is the best adapted. Kentish recommended that the surface should be constantly covered with very finely levigated chalk, which should be applied in sufficient quantity to absorb all the discharge. And it certainly is a most excellent and expeditious remedy, alike excluding irritation and repressing fungous granulations. The chalk may be covered with simple lint or linen, and sufficient bandage to keep it on.

It would be scarcely possible to enumerate all the applications recommended in these cases, and their number alone is a pretty certain indication that they all of them too frequently fail. The formation of an eschar by nitrate of silver on Higginbottom's plan; lotions of that substance, or of sulphate of zinc; Turner's cerate (*cer. calaminæ;*) simple lint;—pressure with sheet lead, or with strips of plaster; are the most useful. Decoction of elm bark is a good lotion when the sore is irritable. If small abscesses form under the skin, or the sore extends itself by ulceration, poultices may be employed till the pain and irritation have ceased; and then whatever other measures may be appropriate to the circumstances. Care must be taken to counteract the tendency to contraction by frequent motion of the parts, and by fixing the skin. If the fingers are severely burned, it is very difficult to prevent them from adhering together, although it should be attempted by interposing lint between them, and keeping them asunder. It may be of some use to lubricate the cicatrised parts with pure oil. But

* Second Essay, p. 64.

if, notwithstanding, contraction does take place and form an obstacle to any necessary motion, the only remedy is the extirpation of the cicatrix, if it can be done with safety.

SUNDRY REMEDIES.—It remains to notice divers remedies which have acquired popularity in the cure of burns; and they all, as Mr. James observes, either possess certain stimulating qualities, or else exclude the influence of air and temperature.

The *liniment composed of equal parts of linseed oil and lime-water*, or *Carron oil*, (so called because in general use at the iron works of that name,) is a good defensative, and but for its nauseous odour might be employed in dressing the wounds after the first turpentine dressings are taken off. It is sometimes applied after cicatrisation, to prevent contraction. *Lime-water and milk* is an analogous preparation.

Soap-liniment is a good stimulant; but is more expensive than turpentine, and not better.

Common thick white paint has, according to Sir C. Bell, been used at the Middlesex Hospital; but, from its containing white lead, its protracted application might be hazardous.

Flour is a remedy very much in vogue with some people. It should be applied thickly with a common dredger, so as to cover every part denuded of cuticle.

Cotton, very soft and finely carded, is another popular application. Like the flour, it is directed to be laid on the raw surface, and to be perpetually strewed on in thick layers, so as to soak up the discharge; but without removing any which is already applied. The good effects of these two substances depend on the same principle. They exclude the air, and form a soft covering. If there is nothing else at hand, either of them may be applied. But they are mere negative remedies, such as no surgeon ought to use in severe cases. When they have been applied for some time, they are apt to become dry, hard, and irritating, and not unfrequently become converted into a most noisome mass of putridity and maggots.

Vinegar.—Mr. David Cleghorn, an Edinburgh brewer, published three letters to Hunter, in the second volume of the Medical Facts and Observations, in which he very strongly recommends the application of warm vinegar for the first twelve hours, then poultices till suppuration is established, and chalk afterwards. Although not a surgeon, he writes with common sense and modesty. He agrees remarkably with Kentish, in recommending that stimulant applications should be applied only during the first few hours, whilst the injury is recent.

CHAPTER VI.

OF THE EFFECTS OF COLD.

EFFECTS OF SEVERE COLD.—When a person is exposed to very severe cold, especially if it be accompanied with wind,—or if it be during the night,—or if he have been exhausted by hunger, watching, and fatigue, he feels an almost irresistible impulse to sleep, which, if yielded to, is soon succeeded by coma and death. During the state of coma, the body of the sufferer is found to be very pale and cold; the respiration and pulse almost imperceptible, and the pupils dilated. The limbs are flexible as long as life remains, unless the degree of cold be very great indeed. On a *post mortem* examination, the chief morbid appearances observed are great venous congestion and serous effusion in the head.

FROST-BITE.—But if the trunk of the body be well protected, the cold may only affect some exposed part, such as the nose, ears, or extremities. The first visible effect is, that the part becomes of a dull red colour;—an effect of cold which is notoriously frequent, and which depends on a diminution of the quantity of blood conveyed by the arteries, and a stagnation of it in the veins. If the cold continue, this venous blood will be gradually expelled by a contraction of the tissues, and the part will become of a livid, tallowy paleness, perfectly insensible and motionless, and much reduced in bulk. When in this condition, a part is said to be *frost-bitten*. The patient may be quite unconscious of the accident that has befallen him until he is told it by some other person; especially if it be his nose or ear that is affected, or some other part that he does not move.

A frost-bitten part may mortify in two manners;—1st, by *direct sphacelus*, if no reaction whatever is induced; 2ndly, by *gangrenous inflammation*; if reaction, when induced, be rendered too violent.

The degree of cold required to produce frost-bite under any ordinary circumstances of exposure must be considerably below the freezing point. Mr. Guthrie states it at ten degrees below the zero of Fahrenheit. The natives of warm climates may suffer severely from cold that would be innocuous to the inhabitants of colder regions. Thus during the siege of Ciudad Rodrigo, when the troops were obliged to sleep on the ground without cover, three of the Portuguese actually died of the cold in one night, whilst the British escaped without being frost-bitten. Those who indulge in spirituous liquors, exhausted as they are by perpetual stimulation, are much more liable to suffer than the temperate.*

* Op. cit., p. 141.

It is well known that a *small* part of the body may be frozen so as to be quite white, and hard, and brittle, and yet recover with proper care. This fact was frequently exemplified in Hunter's experiments on the ears of rabbits, and combs of cocks. And some of the lower orders of animals may be entirely frozen and yet survive. But it is not credible that a whole limb of a human being, much less that the whole body, could be frozen without death ensuing; although stories of such occurrences have long been current amongst authors.

TREATMENT.—The indications of treatment whenever a part or the whole of the body has been exposed to severe cold, are, 1st, To produce *moderate reaction*, and restore the circulation and sensibility; 2ndly, To *avoid excessive reaction*, which would surely lead to violent and dangerous inflammation.

Of Frost-bite.—The best remedy for a frost-bite is to rub the part well with snow. For whilst the friction restores the circulation and sensibility, the snow prevents any excessive reaction. After a time cold water may be substituted for the snow, and the friction may be rendered brisker. These applications must be made in a room without a fire; and a high, or even a moderate, temperature must be avoided for some time. By these means no other inconvenience will ensue, save slight swelling and tingling, with vesication and desquamation of the cuticle; although the part will remain weak and sensible to cold for some time.

For the *coma induced by cold* the treatment must be similar. At first the body should be rubbed with snow;—afterwards, when its warmth and sensibility are a little restored, it should be wiped quite dry, and be rubbed with fur or flannel. Then the patient should be put into a cold bed in a room without a fire, a stimulant enema should be administered, and a little warm wine and water, very weak, be given as soon as he can swallow. The enema may be composed of water and salt, with a little oil of turpentine; but tobacco, which was formerly recommended by the profession in such cases, and is still popularly considered to be of great service, must not be thought of;—it would surely be prejudicial—perhaps deadly. The after-treatment must be entirely regulated by the state of the patient;—the strength must be supported by mild cordials and nutriment; care being taken not to excite feverishness or headache.

The *contact of any intensely cold body* (such as frozen mercury) causes severe burning pain, followed by vesication. It thus appears that the effects of sudden abstraction may be similar to those of too great communication of heat. The best application is snow, gradually permitted to thaw.

VIOLENT GANGRENOUS INFLAMMATION may be caused, if heat is injudiciously applied to frozen or frost-bitten parts. It may also ensue if a part has been exposed for a long period to a *low temperature* which is *suddenly raised*;—although the cold

may not have been sufficient to cause actual frost-bite, and may have been tolerated without inconvenience. A good example of this accident is narrated by Baron Larrey,* as it affected the French troops during their campaign in Poland in 1807. During the few days preceding and following the battle of Eylau the cold was most intense, ranging from ten to fifteen degrees below the zero of Reaumur.† But although the troops were day and night exposed to this inclement weather, and the soldiers of the Imperial Guard, in particular, were nearly motionless for more than twenty-four hours, there were no complaints of its effects. On the night of the 9th of February, however, *a sudden thaw commenced*, and immediately a great number of soldiers presented themselves at the "*ambulances*," complaining of severe numbness, weight, and pricking pain in the feet. On examination, some were found to have slight swelling and redness at the base of the toes and dorsum of the foot; whilst the toes of others had already become black and dry. And in this manner, the toes, and sometimes the whole foot, perished; the mortification being so rapid that it was difficult to say whether it was preceded by inflammation or not—although it probably was so for a very brief period. The best *treatment* for such cases is the application of snow or very cold water, followed by evaporating lotions. These, if employed early enough, may prevent gangrene; or even if that have actually occurred, they should be used as long as it appears to be spreading. Subsequently, stimulating poultices and ointments should be employed to hasten the separation of the sloughs, and to promote granulation.

CHILBLAINS consist in an atonic inflammation of the skin, induced by cold.

THREE DEGREES.—They may present themselves in three degrees. In the *first*, the skin is red in patches, and slightly swelled; with more or less itching or tingling, or perhaps pain and lameness. In the *second*, there are vesications—the skin around being bluish or purple. In the *third* degree there is ulceration or sloughing.

CAUSES.—Chilblains are most frequent in women, children, and weakly persons generally. Some constitutions (especially those of a rheumatic diathesis) appear to be originally predisposed to them; others are, from some unknown reason, totally exempt. They are generally induced by sudden alternations of temperature; such as warming the feet and hands by the fire when cold and damp.

TREATMENT *of the First Degree.*—The best treatment consists in a combination of local stimulants and depletion. When there is much heat and itching, it is an excellent plan to apply a

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* Mem. de Chir. Mil., tom. iii. p. 61.

† From 20° to 25° below the freezing point of Fahrenheit.

leech;—or to make punctures with a needle or lancet, (or with holly-leaves, if preferred.) It would be impossible to name any stimulant that has not been recommended by the public or the profession. Perhaps the best is that proposed by Mr. Wardrop, and consisting of *six parts of soap-liniment, and one of tincture of cantharides.* But liniments of mustard, turpentine, camphorated spirit, and ammonia;—friction with snow;—strong brine, or, in fact, any ordinary stimulant, will answer the same purpose. Whichever is chosen, it should be used cold, with considerable friction, and should be strong enough to excite some increase of heat and smarting.

If there be *vesications*, care must be taken not to break them; and the liniment must be applied lightly with a feather.

If there be *ulcers or sloughs*, and they be attended with much heat, pain, and irritation, poultices are required. But as a general rule, they are too relaxing, and stimulating ointments or lotions (such as Turner's cerate, ung. resinæ, ung. zinci, &c.) should be preferred.

CHAPTER VII.

OF THE EFFECTS OF MINERAL AND VEGETABLE IRRITANTS.

General Observations.—These substances, considered with regard to their local effects, may be divided into two classes. *First*, those which produce inflammation of the animal tissues through their tendency to *decompose* them *chemically*. *Secondly*, those which operate by producing *violent irritation*, but which have no power of causing chemical decomposition.

The *first class* comprehends the strong mineral acids;—the pure alkalis, or their carbonates; sundry metallic salts, such as corrosive sublimate, nitrate of silver, and butter of antimony;—and the concentrated vegetable acids, especially the acetic and oxalic.

The *second class* includes arsenic amongst minerals, and the whole list of acrid plants, garlic, ranunculus, euphorbium, and the like,—amongst vegetables.

Acids.—The decomposing agency of the concentrated acids appears to depend mainly on their affinity for water. The *sulphuric acid* blackens or *chars* the tissues in destroying them; that is, separates the water and other constituent elements, and sets free the carbon. The *nitric* turns them permanently yellow. The *hydrochloric* leaves a dead white stain. The *hydrofluoric* "is, of all known substances," says Turner, "the most destructive. When

a drop of the concentrated acid of the size of a pin's-head comes in contact with the skin, instantaneous disorganisation ensues, and deep ulceration of a malignant character is produced."* *Phosphorus* seems to act both by the heat disengaged in its combustion, and by the acid which is the result of it.

Treatment.—After injury from any of these acids, the first thing to be done is to wash it away, and neutralise it by repeated ablution with warm soap and water; then to apply poultices or any simple dressings to the ulcers that remain. The pain of these injuries is greatly increased by cold.

ALKALIS AND CAUSTIC EARTHS.—These, like the acids, appear to destroy animal matter by combining with its water. They also form a soap with the fat. Caustic potass, in the form of *liquor potassæ*, and quick lime, are the substances of this class which most frequently give rise to accidents. The *liquor ammoniæ* produces almost instant vesication and great pain when it touches the skin; it is, therefore, much to be prized as a speedy and efficient counter-irritant.

Treatment.—Ablution with weak warm vinegar and water, followed by poultices and simple dressings.

METALLIC COMPOUNDS.—The *bichloride of mercury* acts by its tendency to combine with albumen; and the *chloride of zinc*, and *chloride* (or *butter*) *of antimony*, probably produce their cauterant effects in a similar manner. The *nitrate of silver* is remarkable for the superficiality of its effects. It may vesicate the skin, or destroy a film on the surface of a sore, but its action does not spread. Hence, Mr. James deduces its utility in exciting adhesion, and checking spreading inflammations; erysipelas, and the like. It suffers decomposition at the moment of its contact with the animal tissue; its acid appearing to be separated, whilst the metallic oxide combines and forms a white crust with the animal matter: and this soon becomes black, because the silver loses its oxygen, and is reduced to the metallic state.

Treatment.—The bichloride of mercury is rendered inert by white of egg mixed with water;—the chloride of antimony is decomposed by water;—the nitrate of silver by common salt; and the chloride of zinc by a solution of an alkaline carbonate. These, therefore, would respectively be the proper applications for external injuries caused by these metallic compounds; although such cases very rarely come under the surgeon's cognisance.

Arsenic, if locally applied, produces inflammation, or sphacelus, not by any chemical action, but by its influence on the vital properties of the part;—it will also be most probably absorbed into the circulation, and produce its ordinary constitutional effects as well. The *surgical treatment* of any local injury from this mineral

* Elements of Chemistry, 5th ed. p. 377.

must consist in removing it as far as possible by ablution or otherwise, and then applying poultices, or whatever other dressings may be most appropriate. Lime-water might be useful, if applied at first. Some cases, almost too horrible to think of, are recorded of the destruction of women by the local application of this poison.

Acrid Vegetables.—The inflammation excited by these substances requires merely soothing fomentations and emollient dressings. The smart from the sting of nettles may, it is said, be allayed by a weak infusion of tobacco, if severe enough to require any remedy at all.

If an irritating fluid have been injected into the cellular tissue, free incisions must be made, both to allow its escape, and to afford exit to pus. By this means sloughing of the skin may often be avoided, although very likely to occur when the subjacent tissue is extensively disorganised.

CHAPTER VIII.

OF THE EFFECTS OF THE POISON OF HEALTHY ANIMALS, AND OF THE TREATMENT OF POISONED WOUNDS GENERALLY.

Insects.—The bite or sting of any insects that are met with in England are not of sufficient importance to need surgical assistance, unless inflicted in extraordinary numbers, or in peculiar situations. Mr. Lawrence mentions the case of a French gentleman who was so severely stung by bees about the upper part of the chest, that he died in fifteen minutes, with all the symptoms of mortal collapse usually produced by the bite of venomous serpents. Children, if much stung by bees or wasps, may suffer severely from headache and fever. But the most common instance of danger from these insects is the alarming suffocation produced when their sting is inflicted in the pharynx or back part of the mouth;—which sometimes happens when they are concealed in fruit, and are incautiously taken into the mouth.

Treatment.—If a person have been stung sufficiently to cause faintness or constitutional depression, cordials and opiates must be administered without delay. Respecting the *local treatment*, the first thing to be done is to examine the parts with a lens, and extract the stings with a fine forceps, if they have been left in the wound, as they very frequently are. Then the best remedies are

* Lectures, Med. Gaz., vol. v. p. 582.

those which are also most useful in burns, viz. turpentine, hot vinegar, hartshorn, spirit of wine, eau de cologne, or other stimulants. Cold applications give great relief, if used continuously. Finely-scraped chalk, flour, starch, or oil, are favourite remedies with some people. Mr. James recommends a combination of ung. hydr. fort. and liq. ammoniæ. A weak infusion of tobacco or belladonna might be worth trying. The soap-liniment, or compound camphor liniment, may be used to remove the œdematous swelling that remains.

In the case of a *wasp or bee sting in the fauces*, with urgent danger of suffocation, leeches should be plentifully applied both externally and internally;—and hot stimulating gargles (especially hot salt and water) should be frequently used, in the hope of reducing the tumefaction, by causing a copious flow of blood and of saliva: but if these measures fail of affording relief, an opening must be made into the larynx or trachea.

For the bites of bugs, fleas, gnats, mosquitoes, &c., the best remedy is eau de cologne, or some other stimulant, so as to convert the itching into slight smarting. Any strong perfume will often act as a protective against these nocturnal visitants. Sweet oil rubbed over the body is said to have the same effect; a little colocynth pulp, powdered, and sprinkled about, is also said to be a sure remedy.

SERPENTS.—The properties and effects of the *venom of the viper* were most painfully investigated, in every possible point of view, by the Abbé Fontana;* and, in contradiction to the fables of preceding writers, he ascertained that it is a yellow viscous liquid, not inflammable, and neither acid nor alkaline;—that it contains no salts; and that it has no taste, except, perhaps, a slight astringent sensation if it be kept in the mouth for some time. It is not hurtful to another viper, nor does it appear to affect certain cold-blooded animals, as frogs. Moreover, it is perfectly harmless if applied to any natural mucous or cutaneous surface;—so that large quantities of it have been swallowed with impunity. These accounts of the viper's poison entirely coincide with the later observations of Dr. Russel on the poison of other serpents. Thus he found that the bite of a *cobra di capello* killed a serpent called *Nooni Paragoodoo*, but not another cobra; and that it was entirely insipid when taken into the mouth, and productive of no ill effects when applied to the eyes of chickens.†

The symptoms produced by a wound from any of the varieties of these animals are the *same in kind*, although they *differ in de-*

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* Felix Fontana, Treatise on the Venom of the Viper; translated by Joseph Skinner. 2nd edit. Lond. 1795.

† Patrick Russel, M.D., F.R.S. An Account of Indian Serpents. 2 vols. folio. Lond. 1796.

gree and severity, according to the following circumstances;—viz. according to the species of the animal, to its state of vigour or otherwise;—to the frequency with which it has bitten,—and to the age, strength, and state of health of the sufferer. The only poisonous serpent in the British Isles is the viper; but cases of death produced by it, although occasional, are rare.

Symptoms.—The effects of snake-bites may, according to Sir Everard Home,* be divided into two stages, either of which may prove fatal. The *first* consists of the collapse and prostration of strength which immediately follow the injury, and may last for sixty hours. In the *second* stage the system may be exhausted by the local effects of the poison; viz. suppuration and mortification of the cellular tissue.

Symptoms during the First Stage.—Immediately after the bite, the wound is intensely painful; the patient becomes incoherent and frantic, as though intoxicated; his skin is cold, and often becomes speedily jaundiced; the pulse is extremely quick and weak; —then come on vomiting, depression of spirits, and fainting-fits, which may be soon followed by death. Meanwhile the limb which was bitten swells greatly, from an effusion of acrid serum into the cellular tissue; it becomes cold, tense, and shining;—the swelling extends along to the neighbouring part of the trunk; and the skin frequently assumes a mottled and livid aspect from an extravasation of blood beneath it.

During the Second Stage, the parts in the immediate vicinity of the wound, and those which have participated in the swelling, inflame violently. Portions of cellular tissue sphacelate; immense *diffused* abscesses are formed; and the system is affected with fever of an irritative or typhoid character—both from the extent of the local mischief, and from the depressing effects of the venom on the vital powers; so that if the patient have survived the immediate effects of the injury, he may yet die more miserably from those that follow.

Pathology.—The venom of serpents is one which manifestly acts on the *vital properties* of the frame. This is proved, 1st, by the want of any *mechanical* or *chemical* endowments to account for its deleterious effects; 2ndly, by its not acting on every animal, and by its being harmless unless injected into a recent wound; 3rdly, by the fact ascertained by Fontana, that when added to recently drawn blood, it instantly turns it black, and prevents its coagulation. The violent constitutional depression manifested during the first stage seems to depend on the affection of the nervous system, by its absorption into, and contamination of, the blood. Locally, it excites *diffuse inflammation of the cellular*

* Sir Everard Home. Phil. Trans. vol. 100. Case of T. Soper, who was bitten by a rattlesnake.

tissue, an inflammation terminating in unhealthy suppuration, and destitute of the tendency to form adhesive lymph. Sir E. Home caused a serpent to bite some rats; and although one of these animals died in less than a minute, he found the cellular tissue of the bitten part "*destroyed*," and the neighbouring muscles most highly inflamed. In the case of Soper, the absorbents were not inflamed.

TREATMENT *during the First Stage.*—The indications are to remove the poison from the wound, or at all events to prevent its absorption;—and to counteract its baneful effects on the blood and nervous system.

If no other means are at hand, a ligature should be tightly applied round the limb, as near as possible to the wound, and between it and the heart—so as to prevent the return of venous blood from it. Then it should be thoroughly sucked, taking care that the person who does so, has no sore nor recent abrasion in his mouth.

A better plan, however, is to cut out the bitten part as freely as may be necessary, and then to suck the wound, and bathe it thoroughly with warm water to encourage bleeding—a ligature being also applied, as in the last case.

But the best plan of all is that recommended by Sir David Barry.* He directs, first, that an exhausted cupping-glass shall be applied over the wound for a few minutes;—next, the glass is to be taken off, and the wound freely excised;—and, lastly, the glass is to be applied again, in order to promote the flow of blood, and cause the re-exudation of any of the poison that may have found its way into the neighbouring blood-vessels.

The reader scarcely needs be informed that the cupping-glass, used in the manner we have just detailed, was introduced by Sir D. Barry as a certain protection in all cases of poisoned wounds. It possesses all the efficacy, and none of the disadvantages, of ligatures;—for without interrupting the general circulation of the limb, it produces a complete afflux of all the fluids in the vicinity towards the wounded part, and entirely prevents them from conveying their contaminated contents towards the centre of the circulation. If the glass is applied in this manner, it is far from being advantageous (as is generally supposed) to make incisions or scarifications near the wound, whether before or after its excision. For the object is to concentrate the course of the blood towards the original wound itself,—that so it may carry the venom with it as it escapes;—and this object would be counteracted by any extraneous incisions.

The *constitutional treatment* consists in the administration of

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* David Barry, M.D. Experimental Researches on the Influence exercised by Atmosphoric Pressure, &c. Lond. 1826.

powerful diffusive stimulants. Ammonia, æther, and laudanum, with hot wine or brandy and water, should be given in repeated doses. The favourite preparation of ammonia for these cases is the *eau de luce*, or *tinctura ammoniæ composita* of the new Pharmacopœia. It contains oil of amber. The dose is ℥xxx. every half hour, or as much oftener as the stomach will bear it. If there is violent spontaneous vomiting, it should be checked by a large dose of solid opium, and mustard poultices to the epigastrium. But if there is no vomiting, it should be excited by art, in order to get rid of a vast quantity of bile, which under these circumstances is suddenly formed in the blood and secreted by the liver.

Arsenic has long been a popular remedy for these accidents in the East Indies. It is usually administered in the form of a nostrum, called the Tanjore pills, each of which contains a grain of it, combined with certain unknown acrid plants. The efficacy of this mineral was also fully established in the West Indies by Mr. Ireland, surgeon to the 16th regiment, who employed it with perfect success in five cases of the bite of a serpent, which had previously killed several officers and men, some within six hours, and all within twelve.* He combined f℥ii. of the *liquor arsenicalis* with gtt. x of tinct. opii., (to prevent vomiting,) f℥iß of peppermint-water, and f℥ss. of lime-juice. This draught, which contains a grain of the arsenious acid, was given every half hour for six or eight doses, till it produced copious purging, (which was encouraged by clysters,) or till the symptoms were ameliorated. The swelled parts were well rubbed with a liniment of olive oil, turpentine, and liquor ammoniæ; and the patients, although for a time greatly debilitated, were soon able to return to their duty.

Oil has been very warmly recommended, both as an internal and external remedy in these cases; on what grounds it is difficult to conceive. The *fat of the viper*, a strong nauseous substance, is said to be a specific for its bite; but its efficacy is very questionable.

During the second stage stimulating embrocations should be applied to the swelled parts, in order to invigorate their vital actions, and promote absorption of the fluids effused. But if, in spite of these, and of leeches and hot anodyne fomentations, the swelling increases, and rigours and severe constitutional disturbance indicate the formation of matter, free and extensive incisions should be made without delay. The *constitutional treatment* must be regulated by the symptoms actually present; it will mostly require a combination of cordials, opiates, and tonics. *Senega* and *serpentaria* have been in great repute in these cases; and of tonic stimulants they are perhaps the most useful.

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* A Letter to T. Chevalier, Esq., on the effects of arsenic in counteracting the poison of serpents. Med. Chir. Trans. 1813, vol. ii. p. 396.

CHAPTER IX.

OF THE POISONS CONTAINED IN DEAD HUMAN BODIES, AND OF DISSECTION WOUNDS.

SECTION I.—OF THE POISONS CONTAINED IN DEAD BODIES, AND OF THE INFLUENCE OF DISSECTION ON THE HEALTH.*

It appears that two distinct classes of poisons may be contained in the human body after death. The *first class* consists of certain poisons found in fresh bodies; and either produced immediately after death, or perhaps originating in some morbid condition of the soft solids and fluids that existed during life. The *second class* comprises the poisons resulting from putrefaction.

1. The *first class* of poisons appears to contain many varieties. One of the most common of them is a *gaseous emanation* of a *faint, sickly,* and indescribably *nauseous* odour. It is, perhaps, most commonly observed to proceed from the bodies of those who have died of fever; but this is not quite certain. This emanation is so abominably nauseous, and so sedative in its effects, that it often causes sickness and faintness in those who would be unaffected by the most advanced putrefaction. A *second variety* is that which, when inoculated into a recent puncture, and sometimes even if applied to the unbroken skin, is capable of producing the most fearful irritative and typhoid fever, with diffuse inflammation of the cellular tissue. This poison is most common in the bodies of those who have died of inflammation of the serous membranes, especially of the peritoneal inflammation attending puerperal fever. It is altogether distinct from the last, and cannot be detected by any peculiar effluvium; it is very possible, however, that they may co-exist in certain cases. Both these poisons appear to be decomposed or dissipated as putrefaction advances.

2. The *second class* of poisons, those, namely, arising from putrefaction, consist of the compounds of hydrogen, hydrosulphuric acid, carburetted and phosphoretted hydrogen, carbonic acid and ammonia, on whose chemical and sensible qualities the author need not enlarge. In the last few years an attempt has been made to persuade people that the effluvia of putrefaction are rather salu-

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* For much valuable information on the subject of the present section, the author is indebted to a learned and elaborate paper, read before the Medical Society of King's College, London, by W. Bowman, Esq., some time a student in that institution.

brious than otherwise, or at all events that they are not prejudicial to the health, because the workmen employed in the well-known *knackeries* of Montfauçon near Paris, as well as men who grind bones, or who are engaged in the manufacture of catgut, or candles, or leather, are in no manner inconvenienced by their offensive occupations. This dogma is sufficiently newfangled, paradoxical, and absurd, to be greedily seized upon and advocated by those who patronise the march of intellect. But although it is perfectly true that healthy persons, who use considerable exercise, and are much in the open air, and who live well but not intemperately, may be enabled to resist these noxious influences; still daily experience shows that those whose natural strength and habits of life are not so favourable to the developement of their vital energies, cannot be exposed to them with impunity. Or why banish churchyards from crowded cities?

If the student of anatomy be naturally vigorous, and if he carefully avoid all concomitant sources of indisposition, it will be long before dissection (pursued as it is in these degenerate days) be found incompatible with even a high state of health. But if it be too ardently followed, it will lead to a slow and insidious disorder, consisting of a general enfeeblement of the vital powers, with marked disturbance of the digestive organs.

SYMPTOMS.—The first symptoms noticed are headache, drowsiness, and lassitude, in the evening; disturbed and unrefreshing sleep; coldness of the feet and hands, and flatulence of a fetid nature. The bowels are occasionally costive, but much more frequently the reverse; insomuch that (in the words of the above-mentioned essay) diarrhœa is not unfrequently regarded as a test of the pupil's assiduity. The evacuations are remarkably fetid; and if, as sometimes happens, the diarrhœa is unusually severe and complicated with dysentery, they may be tinged with blood. Sometimes the upper portion of the alimentary canal is the principal seat of disorder; and instead of diarrhœa there are nausea, foul taste in the mouth, fetid eructations, want of appetite, and oppression after eating. It is not very uncommon for jaundice to occur, with or without pain in the back, fulness in the hypochondria, and other signs of hepatic congestion. Lastly, the same causes applied more continuously and intensely, or aided by other unfavourable circumstances, may produce continued fever of various grades of malignity.

TREATMENT.—These symptoms may, if taken early enough, be easily removed by the fresh air of the country; by aperients and alteratives, with tonics and good living. And they are to be prevented by regular daily exercise, generous diet, warm clothing, the strictest cleanliness,—and by other means for the preservation of health, with which every one is acquainted.

The *efficient cause* of this indisposition is doubtless an enfeeble-

ment of the vital powers, principally induced by the *absorption of poisonous miasmata.* And the proofs of this absorption are so clear;—its effects on the system so marked;—and the manner in which the absorbed substances are eliminated, is so plain, that some light may doubtless be thrown on the *modus operandi* of other miasmata, which do not present themselves so palpably to the senses.

It not unfrequently happens that deleterious gases are absorbed in great quantity; either because they are present in unusual abundance, or because (as we may suppose) the vital powers of resistance are lowered. The following are instances of their effects, and of the manner in which they are got rid of by the system. A gentleman, after a hard day's dissecting, goes home;—finds himself heavy, listless, and indisposed, and with the peculiar smell of the dissecting-room clinging to him. He changes every particle of his apparel, and gives himself a thorough ablution. But in a very short time the same odour emanates from every part of him;—and it is not till after copious perspirations in the night that he is freed from the annoyance. Three gentlemen, friends of the author, one morning last winter dissected a fresh subject, from which proceeded the *peculiar sickly effluvium* that has been alluded to. On their return home, the weakest of them vomited;—the other two suffered from nausea and depression;—and they all had for several hours a continual sickly taste in their mouths, similar to the smell which they had been imbibing. And it is notorious that dissectors frequently recognise the smell of their subjects in the secretions of their mouths, and in the copious flatus extricated in their stomach and bowels.

From these facts it may be concluded that putrid and other deleterious gases may be absorbed into the blood;—that the skin and bronchial membrane are the points of ingress;—that they may be eliminated by the skin and mucous membranes without any alteration of their sensible qualities;—and that their elimination by the gastro-intestinal mucous membrane is the chief cause of the diarrhœa which is such a frequent consequence of anatomical zeal.

SECTION II.—OF DISSECTION WOUNDS.

The two most important consequences of those wounds are as follows, viz.

1. Inflammation of the lymphatics; and,
2. Adynamic or typhoid fever, with diffuse inflammation of the cellular tissue.

The *causes* of these effects may be,

1. The irritation of a trivial wound, operating on an unhealthy constitution; or,

2. Inoculation with a morbid poison.

And the morbid poison so inoculated may be twofold; viz.

1. The specific virus generated in recently dead subjects; or,

2. The common products of putrefaction.

Of inflammation of the lymphatics, arising from these as well as from other causes, we shall speak elsewhere.* In this place we shall describe the symptoms and treatment of the adynamic fever and diffuse cellular inflammation.

Symptoms.—The poison having gained admission into the system through a wound, (which is in most cases so slight as to pass unheeded,) at a period varying from six to eighteen hours subsequently, the patient feels generally unwell; he is depressed, faint, and chilly, and complains of lowness of spirits and nausea. These symptoms are soon succeeded by rigors, severe headache, and vomiting;—the pulse is frequent and sharp, but weak;—the tongue is coated, and there is the greatest restlessness and despondency. Then the *first local symptom* appears in the form of a most excruciating pain and tenderness of the shoulder, corresponding to the hand that was wounded. And in most cases there soon afterwards arises a *pustule*, on or near the wound, which sometimes resembles the small-pox pustule, and in other cases is a flattened vesicle, containing a milk-white serum. But this pustule may be unattended with any pain, and the patient may be ignorant of its existence, or may not even be aware that he has received a wound, till his attention is directed to the spot by his attendants. As the case proceeds, the pain in the shoulder becomes more excruciating, and is attended with fulness of the axilla and neck;—and a doughy swelling appears on the side of the trunk, often extending from the axilla to the ilium. At first it is pale; but it soon assumes an erysipelatous redness, or rather a pinkish tint, like that of peach-blossoms. The breathing now becomes difficult; the pulse quicker and weaker; the tongue dry, brown, and tremulous; the mental distress is truly appalling, although there is seldom delirium; the countenance is haggard, and the skin yellow; and the patient generally expires before the local disease has made further progress.

Varieties and Complications.—These symptoms often present considerable varieties in their progress and degree of severity, and may be complicated with other maladies arising from the same, or from some coexistent cause.

1. In one small class of cases, the influence of the morbid poison is so virulent, that the patient actually *dies of the precursory fever*, before sufficient time has elapsed for any local disease to appear;—either in the axilla, or in the wound, or elsewhere. The most

* Part v., chap. iv.

speedily fatal case on record, that of Mr. Elcock, was of this variety. He died in forty hours from the receipt of the dissection-wound; and the nervous commotion and mental despondency which he suffered were even parallel to those of hydrophobia. Dr. Bell, of Plymouth, died in the sume manner.

2. In another (and by far the most numerous) class, the general order of symptoms is the same that we described in the text; that is, there are, at *first*, general depression and fever;—*subsequently*, diffuse cellular inflammation begins in the shoulder and axilla, and spreads down the side of the trunk.

3. In a third class, diffuse cellular abscesses occur in several remote parts—the knee or elbow, for instance, as well as in the axilla, as in the case of Mr. Shekelton.*

4. In other cases the wounded finger inflames violently, and suppurates or sloughs;—or the diffuse inflammation begins at the wrist, and extends up the arm.

5. In a fifth class, inflammation of the lymphatic vessels may be combined with the peculiar depressing effects of the absorption of poison; as in the case of Mr. James, narrated in his work on inflammation.

Terminations and Consequences.—If the case do not terminate fatally at an early period, extensive and foul collections of matter form in the parts that have swelled;—and abscesses continue to gather under the skin, or between the muscles of the trunk and limbs; and from these the patient may slowly sink;—or, if he survive, his existence may be a mere burden; one or more of the fingers may perish by gangrene, the arm may remain stiff and useless, or the seeds of consumption or dropsy may be left in the system. Mr. Adam has remarked, that in most cases of recovery, every portion of the limb, between the original wound and the part first stricken with pain, was affected with swelling.†

In some cases, severe and protracted pains of a rheumatic character have followed the ordinary train of symptoms. Both Sir A. Cooper and Mr. Abernethy suffered in this manner, and the same happened in some of the cases recorded by Mr. Stafford in his late paper on the subject.‡

Morbid Anatomy.—The morbid appearances are those of the various grades of diffuse cellular inflammation. The following

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* The case of Dr. Bell may be found in Butter on Irritative Fever. That of Mr. Elcock and Mr. Shekelton are quoted at length (with many others) in Travers on Constitutional Irritation.

† Glasgow Medical Journal, August, 1830.

‡ Med. Chir. Trans., vol. xx. 1836.

may be quoted as a fair description of an advanced stage.* The *cuticle* covering the affected side of the trunk, vesicated and wrinkled;—the *cutis* mottled and gangrenous in patches;—the *subcutaneous cellular tissue*, in some parts distended with serum, in others softened and turgid with pus; the *tissue between the muscles* of the trunk, as well as that which separates the different muscular fasciculi, also softened and purulent;—the *muscular fibres*, of a dirty-yellow colour, and softened;—the *axillary glands* enlarged, but not suppurating;—the axillary *artery* and *nerves* healthy;—but the *veins* (especially the smaller branches) dirty red, and softened;—the brachial and median-cephalic veins of the wounded arm, slightly red;—but the fore-arm healthy, and *no connexion whatever to be discovered between the abrasion on the finger and the morbid parts in the axilla;*—the *pleura* of the affected side greatly inflamed;—the lung covered with lymph, and much serum effused into the cavity of the chest.

DIAGNOSIS.—1. *From acute rheumatism* this disease may be distinguished by the suddenness of its invasion; by the precedence of the constitutional symptoms; by their low typhoid type; by the depression of the pulse; by the pain being confined at first to the axilla; by the characters of the ensuing tumefaction; and by a knowledge of the exciting causes.

2. *From Inflammation of the Lymphatics*, the diagnosis is more nice, because that may coexist with this disease, and because it might even be the sole effect of the same poison, (provided that it acted locally.) In inflammation of the lymphatics, however, the disease *begins at the wounded part*,—which swells and becomes throbbing and painful;—the inflammation extends in red lines up the arm to the lymphatics above the elbow, and in the axilla; and the constitutional symptoms are at first those of *inflammatory* fever, although they may become *irritative* and *typhoid*, if the patient be exhausted by pain, or if matter be confined. The broad features of distinction may be thus stated. The constitutional symptoms *precede* the local, in the *diffuse cellular inflammation;* but *follow* them in *inflammation of the lymphatics*. In the *former* disease, the *local affection depends upon the constitutional;* in the *latter* it is the reverse. Again, the two diseases are most remarkably at variance as regards their tolerance of blood-letting; which remedy is as eminently serviceable in cases of pure inflammation of the lymphatics, as it is positively injurious in those which arise from the imbibition of poison.

PROGNOSIS.—Of the cases on record, nearly two-thirds have proved fatal. The danger will be proportionate to the violence of

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* Abridged from the case of Mr. Young, in Duncan's paper in the Edinburgh Med. Chir. Trans., vol. i. Quoted also in Travers, op. cit.

the constitutional symptoms;—the quickness of pulse, anxiety of mind, and prostration of strength. The cases in which inflammation begins at the injured part are much less dangerous than those in which it appears remote from it, or in several places simultaneously.

PATHOLOGY.—Some persons deny that this disease originates in the absorption of poison, and attribute it to mere local irritation acting on an unhealthy constitution. Now it is, on the one hand, perfectly true, that severe or fatal diffuse cellular inflammation, or inflammation of the lymphatics, may be produced by the slightest conceivable injury in a vitiated habit. Witness the Plymouth Dockyard disease; and Mr. Abernethy's celebrated case of a young lady who nearly died from a prick in the finger with a clean sewing-needle.* And it is equally certain that most medical students and practitioners are in a bad state of health, and consequently predisposed to suffer from such accidents. And further, medical students are, as Mr. Colles† and every one else affirm, most liable to suffer during their third academical session, when their health has been thoroughly undermined by two previous winters of hard study, late hours, and, in some few cases, by vulgar debauchery. But there are reasons which, duly considered, place the existence and agency of a distinct morbid poison beyond all doubt.

1. It is a well-established fact, that a *plurality of individuals* are frequently inoculated from *one subject*. This happened in the well-known cases of Professor Dease and Mr. Egan; and numerous other instances of it are on record.‡

2. The disease most frequently arises from *fresh subjects*. Mr. Adam, in the excellent paper which we have before quoted from, has collected forty cases;—and in only two or three out of the whole number did the disease arise from a putrid subject. The most dangerous poison seems to be destroyed by putrefaction; and the disease caused by inoculation with putrid matters is in general mild, and consists of mere inflammation of the lymphatics,—although there are exceptions.

3. The *disease of which a subject died* has a manifest influence on the frequency of ill effects from dissecting it. In two-thirds of Mr. Adam's cases the disease affected a serous membrane;—and the most deadly virus of all is contained in the bodies of women who died during the puerperal state.

4. The disease we have been describing *begins* with symptoms of constitutional disorder; and, in fact, *it may be unattended with*

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* Abernethy's Lectures, Renshaw's edition, p. 132. See the section on *diffused abscess* in part ii.

† Colles, Dublin Hospital Reports, vols. iii. and iv.

‡ Vide Copland's Dict., p. 304.

any local disease whatever. Consequently it cannot be said to arise from local disease, when there is none.

5. It may be induced by immersion of the fingers in the fluids of a dead body, although the fingers may be quite free from wound or abrasion. A remarkable instance of this is related in the third volume of Tyrrel's edition of Sir A. Cooper's Lectures.*

It merely remains to add, with regard to the pathology of this distressing malady, that the poison appears to operate both by depressing the nervous system, and by contaminating the blood;—but which of these effects it produces first, it avails little to inquire;—in fact, it is not easy to conceive how one of them can occur without inducing the other.

TREATMENT.—The indications clearly are, to support the nervous system in its state of depression;—to endeavour to eliminate the poison by attention to the secretions;—and locally to relieve pain and tension, and promote the discharge of pus or sloughs.

As soon, therefore, as the first symptoms of indisposition make their appearance after a wound received during dissection, it will be advisable that the patient should take a mild emetic, have his feet immersed in hot water, and betake himself to a warm bed. Ten grains of ipecacuanha, with an equal quantity of the sesquicarbonate of ammonia, dissolved in a warm infusion of chamomiles or gentian, form the best emetic.† After the vomiting has ceased, he should take a full dose of calomel, which (as recommended by Copland) may be advantageously combined with camphor. In an hour or two it should be followed by a purgative draught;—in which the oil of turpentine, from its tonic qualities and efficacy in allaying nervous irritability, should (as advised by Travers and Copland) form a principal ingredient. (F. 18.) The turpentine, may be combined with castor oil or senna, to quicken its operation, and prevent any irritation of the kidneys. These remedies should be repeated,—and be aided with large turpentine enemata until the bowels are fully unloaded. The medicines subsequently given should be of a tonic and narcotic quality. If the pulse is moderately firm, and there is much thirst and headache, salines in a

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* Travers gives two analogous cases. A Mrs. Clifton died of diffused cellular inflammation following a prick. Two of her attendants became ill from the contact and effluvium of the discharge, although neither had any wound through which a poison might be inoculated. One of them suffered from acute fascial inflammation of the arm; the other from low fever, and abscess in the axilla. The latter was engaged in unfolding some sheets from which a most noisome smell proceeded, when she was all at once seized with sickness and faintness, and excruciating pain in the axilla.—*Constitutional Irritation*, p. 373, third edition.

† As recommended by Mr. James in erysipelas.

state of effervescence; or liq. am. acet., with vin. ipec., and the strong camphor mixture,* may be tried. But in those cases which present a more decidedly adynamic character from the beginning; —and in all cases towards their termination, it will be necessary to administer wine, ammonia, æther, and quinine; together with whatever articles of nutriment the patient can take. *Extreme vomiting* is to be relieved by measures which have already been indicated.† It will be most urgently necessary to render the patient unconscious of his severe pain by narcotics;—and the *muriate of morphia* has proved so beneficial in Mr. Stafford's hands, that it is to be preferred in similar cases. It should be given in a full dose (gr. ½—j) at bedtime, and in smaller ones during the day;—and if the secretions have first been duly regulated, it will most probably allay pain, calm the restlessness and anxiety, and reduce the frequency, whilst it improves the tone, of the pulse.

Local Treatment.—As soon as pain is first experienced in the axilla, numerous *leeches* should be applied, and their bleeding be encouraged by warm poppy fomentations, or poultices sprinkled with laudanum. But as soon as any distinct swelling can be detected, an *incision* should be made into it,—in order to relieve pain and tension, and to prevent the diffusion of serum or pus that may have been formed in the meshes of the cellular tissue. Incisions are the *sine qua non* of the treatment; the point on which success mainly depends;—and it is most truly observed by Mr. Stafford, that in most of the cases that have hitherto occurred, if swelling or abscess formed and were not opened, the result was fatal.

If the patient survive, he should as soon as possible be removed into the country, and be put upon a course of tonics and liberal diet. All the collections of matter which sometimes continue to form for months should be opened as soon as they are detected; and the ulcers that remain be dressed with stimulating lotions and bandages.

Venæsection.—With regard to the propriety of venæsection in this disease, there is but one opinion among the best authorities; namely, that it is uncalled-for and injurious. Those who recommend it do so on mistaken principles. They imagine that they have merely a *local inflammation* to treat, which, it need scarcely be repeated, is altogether an error. But experience, no less than reason, testifies to the impropriety of bleeding. It never has relieved the pain, and has always aggravated the nervous depression. Besides, the blood has never been buffed or cupped, and the coagulum has always been small in proportion to the serum. If

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* Made by triturating ℈j—℥ß of camphor with confection of almonds or calcined magnesia, and adding f℥vj of water.

† Part i. chap. i. p. 3.

the pulse were full, strong, and firm, and there were other signs of sthenic inflammatory action, it would no doubt be called for;—but it is difficult to conceive the occurrence of such a case, and certainly none such is yet on record. We may therefore conclude with Mr. Stafford that it is injurious, "because, in the *first* place, the nervous system has already been depressed by the introduction of the poison;—in the *second*, the fever cannot be considered simply of an inflammatory nature, but rather of an irritative or typhoid kind; and, in the *third* place, although present symptoms may be violent, yet perhaps, from the formation of abscesses, and the general reduction of the patient, he will afterwards require as much of the restorative power as possible to recover his strength."

Calomel is very strongly recommended by Mr. Adam and Dr. Colles, the former of whom concludes that it seems to annihilate the disease. They recommend it to be given alone in doses of gr. iij every three or four hours, so as to salivate in thirty-six or forty-eight hours. It will the more readily do so if the first few doses act on the bowels;—an effect which may be aided by purgative draughts.

Precautionary Measures.—We need scarcely comment on the expediency of using some precautions in performing *post mortem* examinations, especially if the operator be out of health. The wearing of gloves, or smearing the hands with oil or lard, are often recommended, but seldom practised. Sores or scratches on the fingers should be covered with adhesive plaster, or touched with the nitrate of silver to form an eschar. If the operator should puncture himself, or should suffer a scratch or abrasion to come in contact with the fluids of the subject, he should immediately wash his hands, and thoroughly suck the wound. Then a stimulant should be applied to it, in order to decompose the poison and excite a slight inflammation, which will impede absorption. *Nitrate of silver*, or *turpentine*, are as good as anything; the *oil of camphor*, (or *camphoric acid*,) made by dissolving camphor in nitric acid to saturation, is recommended by Copland. It will also be expedient to apply the lunar caustic afterwards, when the constitutional affection is commencing, if it has been neglected at first,—provided that the wound be not much inflamed or irritable.

CHAPTER X.

OF THE EFFECTS OF POISONS GENERATED BY DISEASED ANIMALS.

SECT I.—OF HYDROPHOBIA.

Syn.—*Lyssa, Rabies Contagiosa.*

DEFINITION.—Hydrophobia is a disease brought on by inoculation with the saliva of a rabid animal, and characterised by intermitting spasms of the muscles of respiration, together with a peculiar irritability of the body and disturbance of the mind.

SYMPTOMS IN THE DOG.—The first symptoms of rabies in the dog are an unusual shyness and melancholy. The animal avoids society, refuses his food, and seems to have lost all his vivacity; his ears and tail droop, he looks haggard and suspicious, his eyes are red and watery, and he is constantly snapping at and swallowing straws, litter, and rubbish,—and licking cold surfaces, such as stones or iron. In the next stage the respiration becomes difficult, and there is a copious flow of viscid saliva, with inflammation of the fauces, and fever. The animal is by no means so *invariably* furious as is generally supposed; and it has, in the course of experiments, not always been easy to induce it to bite. Yet it may be said that there is always a greater disposition than usual to bite *if irritated*;—and in some instances there is a state of extreme rage, the animal attacking and biting indiscriminately every person and thing that comes within its reach. It has been presumed that the former milder form occurs in the domesticated and educated dog;—and that the state of uncontrollable and indiscriminate fury is met with chiefly in ill-tempered or wild dogs, and in wolves, foxes, and the other unsubjugated varieties of the canine race. Be this, however, as it may, the breathing becomes more difficult and laborious as the disease advances;—tremors and vomiting occur, and in the course of a few days the animal is carried off in convulsions. The characteristic difficulty of swallowing water is by no means so constant in the dog as in the human subject.

Although these symptoms, when confirmed, can scarcely be mistaken, still it is a matter of certainty that a fatal hydrophobia may be produced by the bite of an animal that does not display the slightest signs of indisposition;—and it is more than probable that some of the cases supposed to have arisen spontaneously in man, or supposed to have occurred many years after a bite, were in reality caused by the saliva of some apparently healthy and un-

suspected animal coming in contact with an unheeded scratch or abrasion. The saliva is doubtless the vehicle through which the poison is introduced;—but whether the effects depend on some alteration in its properties,—or on the mixture with it of any poisonous matters secreted in the mouth, fauces, or lungs, would be by no means easy to determine.

Causes.—The cause of this malady in dogs is most frequently infection from another animal already diseased; yet it may and does arise spontaneously. Its origin has been attributed to various circumstances, especially intense heat or cold;—privation of water; ill treatment, unwholesome food;—a worm under the tongue, and ungratified salacity. The worm under the tongue is a mere fable, and the highly-fed and pampered dogs of the opulent are much more frequently attacked than lean, ill-treated curs. Perhaps the last circumstance assigned is the most probable,—although it cannot be the universal cause.

The animals in which hydrophobia arises spontaneously are the dog, with its congeners the wolf, fox, and jackall, and the cat. But it may be communicated to every other animal without exception;—and *every animal can doubtless reproduce it by inoculation with its saliva.* It was long doubted whether the human subject was capable of conveying the infection, and numerous trials were made without any result. MM. Magendie and Breschet, however, at last performed an experiment which decided the question in the affirmative. They inoculated two healthy dogs on the 9th of June, 1813, with the saliva of a man who was labouring under the disease, and who died of it the same day in the Hôtel-Dieu. One of the dogs escaped; but the other was affected with decided rabies on the 27th of July following, and died of it;—and some other dogs, which it was made to bite, died also. Well-authenticated cases are recorded, in which the disease was communicated to man by pigs and horses;—and there is no doubt but that it would be so much more frequently, if it were the instinct of herbivorous animals to show their rage by biting.

In the *horse* the disease commences with great distress and terror, and profuse sweating; he soon becomes frantic and outrageous, stamping, snorting, and kicking.* In the *sheep*, the symptoms are similar. An instance is recorded in which eight sheep were bitten, and became rabid;—they were exceedingly furious, running and butting at every person and thing, but did not bite. They drank freely.†

Symptoms in Man.—These may be divided into three stages. *First*, the stage of *incubation* or *delitescence*, being that which

* Blaine's Outlines of the Veterinary Art. 2nd Edit. Lond. 1816.

† Lancet, 1829—30, vol. ii. p. 511.

intervenes between the infliction of the bite and the first appearance of the disease. *Secondly*, the stage of *recrudescence*, or of premonitory symptoms. *Thirdly*, the progress of the disease when fully established.

First Stage.—The *duration of the stage of incubation* is exceedingly various. It is seldom less than forty days;—generally from five weeks to three months. But authors are by no means agreed as to its limits. Dr. Bardsley, author of the article on Hydrophobia in the Cyclopædia of Practical Medicine, positively denies that the malady ever comes on after more than two years from the bite; and attributes the cases said to have occurred after that time to "anomalous causes," or to inoculation from some unsuspected source. Other authors, on the contrary, seem to think that it may occur at any indefinite period—even twelve years after inoculation. Dr. Burne* relates the case of a prisoner in the Milbank Penitentiary, who died of it seven years after he was bitten. The unfortunate man had indeed kept two cats in his cell, and it is *possible* (scarcely we think) that he might have received the infection from one of them. They were, however, alive and well at the time of his decease. It must be concluded, therefore, either that hydrophobia may come on seven years after a bite;—or that it may be communicated by animals who are to all intents and purposes healthy. It is more than probable that both these conclusions are well founded. But if a surgeon be questioned on the subject by a patient who has been bitten, it will be his duty to allay his apprehensions as far as possible. He may very safely assure him, that after six months have elapsed, the chance of the disease is very slight indeed;—and that scarcely more than a twentieth of those bitten by dogs really mad are ever affected. By these means the risk of a "*hydrophobia paralyssodes meticulosa*," or pseudo-hydrophobia from fear, (if any such complaint exist,) will be materially lessened. There are no symptoms in this stage of incubation, excepting those of the anxiety which it is very natural that the patient should feel.

Second Stage, or Premonitory Symptoms.—The first thing that attracts attention is a peculiar pain of the wounded part, together with slight heat, redness, and swelling. The pain is observed to shoot in the course of the nervous trunks, and has in general a rheumatic character. Sometimes, instead of it, there is a stiffness or numbness, or partial palsy. In some cases it is unattended with redness or swelling;—in others, on the contrary, the wound has thoroughly inflamed, and has broken out into suppuration afresh, although healed long before. In some instances these premonitory symptoms have not appeared at all;—or have been so slight as to pass unheeded;—in a few instances they have not ap-

* Med. Gaz., April 14th, 1838.

peared till after the accession of the genuine hydrophobic symptoms;—but in general they are observed from two to five days previous to them.

Third Stage.—The first of the actual symptoms of hydrophobia is a vague feeling of uneasiness and anxiety. The patient finds himself generally unwell; his mind is irritable, and his countenance gloomy;—he experiences a succession of chills and flushes, with transient headache; the appetite fails; there is frequently vomiting, and sometimes a well-marked accession of fever. Next, the sufferer complains of stiffness of the neck and soreness of the throat, with severe spasmodic pain at the epigastrium;—the respiration also is embarrassed, and frequently interrupted by sighing. But these symptoms are in most cases attributed to cold, and their real nature is unsuspected, till the patient, at a meal, finds himself suddenly unable to swallow;—and the attempt to do so induces severe spasm in the throat, and a sense of suffocation. It is most frequently at this period that medical assistance is first summoned. The surgeon, on arriving, finds his patient in a state of extreme distress and agitation; complaining of headache, and pain at the pit of the stomach;—the pulse is frequent, the tongue furred, and the skin hot;—on being asked to drink, the sight of the fluid, or the attempt to swallow it, brings on a fearful fit of suffocative spasm.

The most prominent of the symptoms that henceforth present themselves, are three, viz. spasmodic difficulty of breathing and swallowing;—extreme irritability of the body;—and peculiar disorder of the mind.

(*a.*) The *difficulty of breathing and swallowing* depends on spasm of the muscles of the pharynx and larynx. Sometimes the patient can swallow neither solids nor liquids; but more frequently the disability extends to liquids only; because they require a greater exertion of those muscles, and are consequently more liable to excite spasm. It is this circumstance that causes the aversion to fluids, and the alarm at the sight of them, which so generally characterise the disease. At first the spasms are excited only by attempts to swallow fluids;—then they are brought on by the sight or thought of them; or by the motions of spontaneous deglutition;—but as the malady advances, they recur in frequent paroxysms,—sometimes spontaneously, sometimes excited by the slightest noise or touch. When the paroxysms have become fully developed, they cause the most frightful struggles for breath. All the muscles are convulsed;—the face is black and turgid, and the eyeballs protrude from their sockets. They may come on either during inspiration or expiration, but more frequently the latter;—the patient struggling most violently to expel the air that is confined in his chest through the closure of the larynx. In this disease, as in tetanus, the fatal termination may ensue from suffocation in the middle of a paroxysm, although it more frequently happens during an interval, from exhaustion.

(*b.*) Next to the spasm, the astonishing *irritability of the surface of the body* is the most prominent symptom of hydrophobia. The slightest impressions on the senses affect the sufferer most intensely. A look, or a sound;—the opening and shutting of the door of his apartment;—the motions of his attendants;—the reflection of light from a mirror;—the least impression on the skin;—the touch of a feather, or impulse of the gentlest current of air, are sufficient to bring on the convulsive fits, and are most earnestly deprecated by the patient.

(*c.*) The *state of mind* is in most cases extremely characteristic. There appears to be a most profound despair;—an utter incapacity for all comfort and consolation;—corresponding with the patient's haggard physiognomy and restless movements, and his hurried desponding tone of voice. He is also in general unusually talkative and verbose, as though he attempted to relieve or hide his sufferings by ceaseless conversation. But in some cases he is possessed with wild maniacal fury, and is obliged to be confined in order to prevent injury to himself or others;—whilst, as a contrary exception, it occasionally happens, that if he be originally of a strong, resolute mind, he may preserve his composure throughout;—and be to the last endued with sufficient courage to attempt drinking, in spite of the impending horrors of suffocation.

Progress and Termination.—When the disease is fully established, its torments are aggravated by extreme thirst; and still more by a peculiar viscid secretion from the fauces, the irritation of which brings on the convulsive fits, and causes a perpetual *hawking* and spitting—which are very constant symptoms. Not unfrequently there is vomiting of greenish matter mixed with blood. As the disease advances, the convulsions increase in frequency and violence; there is constant restlessness and tremor;—the lips and cheeks become livid, and perpetually quiver; till at length one fit lasts long enough to exhaust the remaining strength, and release the patient from his misery. An entire and remarkable remission (perhaps from the use of medicine) sometimes occurs; and the patient enjoys perfect ease, or perhaps sleeps for some hours;—but yet the symptoms return, after a time, with aggravated violence. Again, in some cases there is perfect calm before dissolution; "the patient becomes tranquil, and most of his sufferings subside or vanish;—he can eat, nay, drink or converse with facility; and former objects associated with the excruciating torture of attempting to swallow liquid no longer disturb his feelings. From this calm he sinks into repose, and suddenly waking from his sleep, expires."*

Morbid Anatomy.—The morbid appearances most frequently found are, great congestion of the membranes and substance of the

* Bardsley, op. cit.

brain and spinal cord, with effusion of serum. Sometimes blood is extravasated around the cervical portion of the cord. The lining membrane of the fauces, œsophagus, trachea, and bronchi, are mostly highly vascular; and the lungs congested. The stomach often contains a darkish fluid, and patches of vascularity of a dark purple colour, are found in it and in the intestines. But although some one or more of these morbid appearances are detected in most cases that are submitted to examination, still there is not one of them that is present invariably. The brain, spinal cord, and fauces have been found pale, and the stomach without spots.

Pathology.—It is quite clear, therefore, that no change of structure that has yet been discovered, can be considered essential to the existence of hydrophobia; and nothing remains but to make use of a pompous unmeaning phrase to hide our ignorance. We may say, that the disease consists in a *peculiar state of the nervous system*. It more particularly affects the parts supplied by the *par vagum*. Whether the virus operates on the blood or on the nervous system primarily, it would be in vain to inquire; most probably on both.

Diagnosis.—1. *From Tetanus.* Hydrophobia is distinguished from tetanus by the complete absence of spasm in the intermissions;—by the peculiar mental affection;—and by other signs which have already been detailed when treating of the latter disease.

2. *From Phrenitis or Mania.*—From these it is known by the spasms and convulsive difficulty of swallowing and breathing;—by the irritability of the surface, and by the salivation and spitting.

3. *From Hysteria.* It will not always be easy to distinguish hydrophobia from hysteria, if it be seen at the commencement, and if it occur in a female, or highly nervous individual, whois aware of the nature and symptoms of the malady, and has been harassed by fears of it. For as hysteria may simulate almost any disease that can be named, an hysteric patient impressed with fears of hydrophobia might easily present the extreme alarm and agitation, and the suffocative difficulty of breathing and swallowing, that characterise it. The diagnosis will be chiefly guided by the event;—by the unequivocal symptoms that must soon arise, if it be the more deadly malady. But a correct judgment may still be generally formed at once by attentive observation;—by endeavouring to detect the inconsistencies, as it were, that are so frequent in hysteria;—the intervals of perfect complacency and cheerfulness, if the patient can be engaged in conversation, and led to forget his malady;—and by the suddenness and instant urgency of the symptoms of hysteria, compared with the more gradual accession of those of hydrophobia. Yet it must be confessed that the diagnosis is by no means always easy. There was a remarkable case at the Middlesex Hospital in the autumn of 1837, which at first so exactly resembled

hysteria, and afterwards the delirium of cerebral irritation, or commencing inflammation, that few of the medical attendants could at first persuade themselves that it was real hydrophobia, and even some of those who believed so at first, altered their opinions afterwards. But although there was not much dysphagia, still the *irritability of the skin*,—the *shrinking and convulsions induced by the slightest breath of air*, and the *salivation*, enabled Dr. Hawkins (a physician distinguished for his tact and nicety of discrimination) to form a correct diagnosis.*

TREATMENT.—(*a.*) *Prophylactic.*—As soon as possible after the bite of a suspected animal, the whole wound should be freely and fairly cut out; and its extent should first be carefully ascertained, so that the complete removal of the virus may be insured. After this, bleeding should be encouraged by the application of a cupping glass; or the wound should be long and diligently washed in warm water; and as a last measure of precaution, especially if the bite have been irregular, (so that it is uncertain whether the excision has been complete,) the part should be cauterised by potassa fusa, or rather by nitric acid.

It is a consolatory fact, that whenever the bitten parts have been instantly and fully removed, hydrophobia has very rarely followed.† And even if a considerable interval has elapsed, this measure should still be adopted; although no credence can be given to the stupid supposition, that the virus remains in the wound during the whole period of incubation, and only begins to be absorbed when the hydrophobia actually sets in:—an opinion sufficiently refuted by the fact, that in one case excision of the wound, performed twenty-four hours after the infliction, (and in another case half an hour,) did not save the patient.‡ Yet, as we before said, it should never be omitted, let the interval be what it may. And one case is recorded in which it is said, that the patient was saved, although the parts were not cut out till the thirty-first day, and not till the symptoms had actually made their appearance. This, however, is doubtful.

Caustic.—By some authors caustic is recommended to the exclusion of excision; especially the nitrate of silver, by Mr. Youatt. This gentleman has certainly a good right to speak in its favour, having been bitten four times, and having used no other preventive. But other cases are narrated in which the immediate and free application of this substance was totally useless. Whether the wound, after excision or caustic, should be allowed to heal,—or be kept open, and made to suppurate by irritating ointments,—is

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* Lond. Med. Gaz., Nov. 4, 1837.

† It is said, however, on the authority of Mr. Callaway, that in one case excision, although *immediate*, was unavailing.

‡ Thompson, in Med. Chir. Trans., vol. xiii.

a disputed point. The weight of authority certainly favours the latter practice, and beyond the inconvenience it can do no harm.

Besides these, there are hosts of preventives that have been in vogue at various times, and whose ready reception affords a good illustration of the extent of human infatuation and credulity. One ingenious gentleman within the last few years has conceived that the virus is slowly but bodily *absorbed from the wounded part by the nerves*, and recommends division of the nearest nervous trunk to intercept its course. Another pretends that certain vesicles appear under the tongue at a given period from the bite; and that if these are found and diligently cauterised, the patient will be safe. At one time it was the fashion to take persons that had been bitten to the sea, and plunge them into it till they were half drowned; at another, they were stewed in hot air and vapour baths. And it would be quite idle to attempt to enumerate the different medicines that have been vaunted as specific preservatives;—the Tonquin, Ormskirk, and Burling nostrums;—guaco, belladonna, broom tops, acids, alkalis, earths, and vegetables.

b. Curative.—We need scarcely say that when once the disease has become established, it has (with rare and doubtful exceptions) proved fatal in spite of every measure that could be devised.

Bleeding has been repeatedly tried (as in tetanus) to a most enormous extent; but it has rarely afforded even a temporary alleviation, and must tend, by exhausting the strength, to accelerate the fatal issue. It may, however, be tried as a *palliative* if the patient be plethoric, and the face becomes very turgid during the spasms.

Warm water.—Magendie and others have proposed, after bleeding, to inject large quantities of warm water into the veins; and it certainly is beneficial, although but for a time.

Opium in different forms has been given most profusely, as it has in tetanus, and with rather more success;—for whether administered by the mouth, or rubbed into the skin, or injected into the veins, it seldom fails to mitigate the patient's sufferings, although it never averts his death. This was most strikingly exemplified in the before-mentioned case of the Milbank prisoner, who died seven years after he was bitten. A blister had been applied along the spine, and ten grains of the acetate of morphia were sprinkled on the denuded cutis. "Scarcely had one minute elapsed," says Dr. Burne, "when we observed the stare of the eyes and the dreadful alarm and anxiety of the countenance to diminish, then the violence of the spasm to abate, and the catchings in the respiration and the retching to subside; and to our astonishment this general amelioration progressed, till in four minutes the countenance had become placid, and the respiration free; the retching had ceased, and the spasms vanished." This improvement, however, did not last very long;—the symptoms returned;—a repetition of the remedy was powerless;—and the patient died. And that is the general history of the effects of opium.

The whole tribe of *sedatives*; *belladonna*, *digitalis*, *tobacco*, *&c.*, have been repeatedly tried, but with similar results. The *hot air bath** and *cold affusion*,—acids and alkalis, especially *ammonia*;—every diuretic, purgative, and sudorific that can be thought of, have succeeded no better. *Tracheotomy*, as proposed by Mr. Mayo, might be serviceable by diminishing the dyspnœa.

In one instance the *liquor plumbi diacetatis* is said to have effected a cure. Mr. Hewitt, surgeon in the Bombay Medical Establishment, has related a single case which occurred in the East Indies in 1822, and in which the patient was saved by violent ptyalism. Several native soldiers and other persons were bitten one night by a wild jackall, which when killed was found to be very feeble and apparently starved, and its liver rotten and full of abscesses. A month afterwards two of the persons that had been bitten were found dead in the fields, and, from the description which was given of their symptoms, Mr. Hewitt judged that they had perished of hydrophobia. Shortly afterwards, three others were seized with the disease, and came under his treatment. He induced salivation in one of them (a woman) by the most profuse administration of mercury, and she recovered; but with the other two, who were men, the same remedy was of no avail. Strangely enough, the natives of these parts were entirely ignorant that such a disease as hydrophobia existed;—a sufficient refutation of the perverse error of those who maintain that it is entirely an imaginary affection brought on by fright.†

In the present state of our knowledge, the principal object in the treatment of this disease is to allay the patient's sufferings. This should be done by the external and internal administration of opium in every form, combined with other sedatives. The strength should be kept up with whatever nutriment can be taken. And if the surgeon imagines that he can give any other remedy with a chance of benefit, and without adding to his patient's sufferings, he should do so. But common humanity requires that the tortures of the disease should not be aggravated by subjecting the patient to hopeless experiments, or to the intrusion of a host of visiters, eager to gratify their impertinent, vulgar, and barbarous curiosity.

In former times it was the custom, in decided cases of hydrophobia, to end the patient's misery by smothering him between feather beds. How such a barbarous practice could ever have been tolerated by the legislature, it is difficult to conceive. Yet the

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* Hot air and vapour baths have been recommended because the dog never perspires, and it was thought that the production of profuse perspiration might cure man. This may be good in logic, but it has not been successful in practice.

† Account of the effects of the bite of a wild jackall in a rabid state, as the same occurred at Kattywar, in the East Indies, in 1822. M. C. T. vol xiii. 1825.

author knows that, within the last twenty years, two respectable practitioners, one of whom is still living, purposely bled a woman to death in a village in Lincolnshire.

In the chapter on tetanus we observed that it was possible to induce complete asphyxia by the *wourali* or other narcotics, that act on the brain and *nerves of animal life*;—whilst in the mean time the heart's action and the functions of *organic life* might be kept up by artificial respiration till the brain had recovered itself. It was further observed that this experiment had been performed on animals in tetanus with a degree of success that justifies repetition. Mr. Mayo has proposed the adoption of a similar measure in hydrophobia;—and hazardous as it doubtless must be, it yet will be fully justified, if further experiments *on rabid animals* show that it may be done with safety and advantage. We not unfrequently read of cases of poisoning by alcohol or narcotics, in which the patient was saved by artificial respiration. It therefore is not improbable, that if in hydrophobia the diluted hydrocyanic acid were gradually injected into a vein till the patient's consciousness was extinguished, and he was just ceasing to respire;—and then if respiration were kept up till it could be performed again by the natural efforts;—that the nervous system, thus as it were withdrawn from the operation of the hydrophobic poison, might survive till its effects had ceased. At all events, it is no argument against a measure that it offers but little hope, when without it there is none; else why perform the Cæsarian section, or tie the aorta?

SECTION II.—OF THE GLANDERS.

SYN.—*Equinia. (Elliotson.)*

DEFINITION.—The glanders is a disease of the horse tribe, communicable to man. It is chiefly manifested by unhealthy suppuration of the mucous membrane of the nasal cavities, and pustular eruptions and unhealthy abscesses on the face and other parts.

SYMPTOMS IN THE HORSE. *Two forms.*—It may occur in two forms, which, however, are merely manifestations of the same disease in different parts. When seated in the *lymphatic system*, it is called *farcy*—when in the *nasal cavities*, *glanders*. But these two forms are essentially identical; the pus of either of them will reproduce the other; and farcy always terminates in glanders, if the animal live long enough.

Farcy begins with hard, cord-like swellings of the lymphatic vessels and glands, called *farcy-buds*. These slowly suppurate, and form unhealthy fistulous sores, which discharge a copious thin sanious matter. If suffered to proceed unchecked, farcy leads to glanders, although more frequently the latter arises first.

Glanders.—Its symptoms are, a *continued* flow of discharge from the nostrils, which discharge is at first thick and glairy, like white of egg; but after a time becomes opake, purulent, bloody, and horribly offensive, retaining, however, its viscidity. Soon after it commences, vesicles form on the Schneiderian membrane, which degenerate into foul and extensive ulcers, and lead to caries of the bones. The external parts of the face may become gangrenous, and the animal may die in a few days with putrid fever;—or he may perish more slowly;—the disease spreading to the lungs, and death being induced by cough, emaciation, hectic, and the formation of unhealthy abscesses all over the body.*

Symptoms in Man.—In its *acute form* in man, the glanders begins with all the symptoms that indicate the absorption of a putrid poison. There are general feelings of indisposition, lowness of spirits, and wandering pains; followed by fever, furred tongue, great thirst, profuse perspirations at night, great pain in the head, back, and limbs, and tightness of the chest. After some days these symptoms increase; there are severe rigors and delirium, often of a phrenitic character; the perspirations become more profuse, and sour and offensive, and are attended with diarrhœa of a similar character. Then *diffused abscesses* appear in the form of red swellings about the joints, especially the knees and elbows — the patient complains of heat and soreness in the throat; the tongue becomes dry and brown, the respiration more oppressed, and the fever assumes a decidedly low malignant character. Next (perhaps a fortnight from the commencement of the illness, sooner or later in different cases,) a dusky, shining swelling appears on the face, (especially on one side,) extends over the scalp, and closes the eyes. Then the characteristic features of the disease appear;—an offensive, viscid, yellowish discharge, streaked with blood, issues from the nostrils; and a crop of large and remarkably hard pustules (compared by some to those of the small-pox, and said by others to be about the size of a pea) appear on the face. In the mean while the swelling and inflammation increase;—a portion of the nose or eyelids mortifies;—the discharge becomes more and more profuse and offensive;—the pustules spread, and extend over the neck and body; fresh abscesses form and suppurate; the thirst is most excruciating; and low muttering delirium and tremors usher in death, much to be wished for.

Varieties.—Sometimes this disease is altogether *chronic*, and very much resembles *oxœna;* there being a viscid and peculiarly fetid discharge from one nostril, with pain and swelling of the nose and eyes;—and emaciation, profuse perspirations, and abscesses near the joints, from which the patient slowly sinks. Sometimes its

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* Blaine, op. cit.

course is analogous to that of *farcy*; as in the case of Mr. Turner, recorded by Travers.* An ulcer forms, and is succeeded by glandular swellings, and by abscesses in the cellular tissue, or joints, or lungs, or other viscera. Or the acute glanders may be *preceded by acute farcy*, the patient having received the infection through a wound which inflames, together with the lymphatics leading from it.

CAUSES.—In the horse this disease may, without doubt, arise spontaneously, when the animal is subjected to the usual influences that generate putrid poisons;—namely, close confinement and ill ventilation, especially on board ship. In man it is produced through inoculation of the matter into a wound; and if the skin be unbroken, it cannot be communicated. The matter from the abscesses or nasal cavities of a man labouring under the disease is capable of infecting the horse; it has also produced it in other human beings. In one of the cases published it appeared four days, in another a month, after inoculation.

PROGNOSIS.—This, in the acute disease, is highly unfavourable; the chronic, however, is sometimes, although rarely, recovered from.

MORBID ANATOMY.—The morbid appearances are the same both in man and in the horse. Clusters of white granules, or tubercles, are found in whatever tissues the disease has invaded; in the Schneiderian membrane, in the antrum and frontal sinuses, and in the vicinity of the different abscesses. The nasal cavities mostly contain a thick gelatinous secretion, and are studded with foul gangrenous ulcers, from which project fungous clusters of tubercular matter.

PATHOLOGY.—The *proximate cause* appears to be a contamination of the blood with the poisonous matter. This is evident from the early depression of strength and spirits, from the profuse and fetid perspirations and purgings, from the consecutive or simultaneous appearance of the local suppurations, with their peculiarly offensive and characteristic discharge, as well as from the black and thin condition of the blood, which has lost the faculty of coagulation.

TREATMENT.—The indications are the same as for the treatment of the disease arising from dissection-wounds, viz. to support the strength, and procure elimination of the morbid poison. No treatment, however, has yet cured the acute glanders in man. Emetics, purgatives, and terebinthinate enemata;—cold applications to the head;—(avoiding leeches, for they cause ugly sores;) —and tonics and stimulants, especially quinine, camphor, and the acids, or chlorides of soda or lime,—are the appropriate remedies. Abscesses should be opened, that their matter may not be re-

* Constitutional Irritation, p. 399.

absorbed;—the nose and the various abscesses should be syringed with antiseptic lotions, and especially with the chlorides, and solutions of creosote;—fumigations of chlorine, and of aromatics, should be copiously used to correct the effluvia—which are not less pernicious to the patient than to his attendants;—the thirst must be abated by soda-water, ginger-beer, and other cooling antiseptic beverages—and any other symptoms that may arise must be combated as they best may. The chronic glanders has been cured by injections of creosote.*

CHAPTER XI.

OF THE VENEREAL DISEASE.

SECTION I.—OF ITS SYMPTOMS AND VARIETIES.

DEFINITION.—The venereal disease (speaking generically) consists in the effects of one or more morbid poisons, generated and usually communicated by promiscuous sexual intercourse.

GENERAL DESCRIPTION.—There are two classes of symptoms in this disease, the primary and the secondary.

I. The *primary symptoms* comprise the effects of the morbid poison on the part or parts to which it is actually applied. And these may be, (1) Inflammation and suppuration of the mucous membrane of the genital and urinary organs. (2) Ulceration of the same parts, or of the skin. (3) Inflammation of the adjacent lymphatic glands.

II. The *secondary class of symptoms* comprises several cachectic diseases depending on contamination of the soft solids and fluids, or on a morbific impression on the nerves of organic life by the diseased secretions, which have been produced in the course of the primary symptoms, and have been absorbed. (1) The first set of secondary symptoms consists of sundry *eruptions on the skin*, ushered in by considerable fever. (2) *Ulcerations* of the *fauces, palate, and nose*, or inflammations of the eye, which mostly appear about the same period with the cutaneous affections. (3) *Pains*

* Vide Elliotson's papers in the M. C. T., vols. xiii., xviii., *(with a coloured plate,)* and xix.; and sundry cases narrated in Travers on Constitutional Irritation, and in the Medical Journals; especially the Med. Gaz. vol. xix. p. 939, and Lancet for 1831-32, vol. i. p. 698. A few weeks since, an account was published in the newspapers of a poor cab-driver who perished of this disease, and it was said that his medical attendant did not know what it was.

in the *joints*, inflammation of the *periosteum*, and caries of the *bones*;—which generally appear subsequently. (4) A multifarious variety of cachectic disorders, which may be termed *tertiary symptoms*; eruptions, pains in the bones and joints; falling off of the hair; general debility; deafness; and a number of other complaints; which are attributable, partly to the venereal poison;—partly to an originally vitiated constitution;—and partly to an injudicious administration of powerful remedies, especially of mercury.

SECTION II.—OF ITS HISTORY AND PATHOLOGY.

We propose in this section to lay before the reader as brief an account as possible of the various opinions that prevail with regard to the history, origin, and nature of this disease; and to state the conclusions that may be drawn from the different facts on record.

The following are the principal questions in dispute:—namely, *First*, Was the venereal disease known to the ancients? *Secondly*, Was it imported from America? *Thirdly*, Are there more venereal poisons than one?—*Fourthly*, Are the poisons which produce *gonorrhœa* and *syphilis* identical?—These questions we will discuss *seriatim*.

I. WAS THE VENEREAL DISEASE KNOWN TO THE ANCIENTS?—(*a*) *Arguments in favour of its antiquity.*—Those who believe that it was known to the ancients argue thus. They affirm that writers on medicine from the earliest ages make mention of sundry ulcerous diseases of the genitals and of the fauces, some of which were most probably venereal. That, in particular, some of the ulcers of the genitals mentioned by Celsus correspond exactly with certain ordinary venereal sores of the present time;—especially, 1st, An *ulcer* which, as he says, *frequently causes phymosis*, but is readily cured by detergent washes. 2ndly, A *sloughing* sore which he calls *cancer*; and 3rdly, A *phagedænic* ulcer.* That Rhazes, an Arabian writer, mentions an ulcer of the penis produced by the "*accensionem mulieris supra virum.*" That sundry foreign authors who flourished between 1270 and 1470, mention ulcers and pustules of the penis as contracted *by lying with foul women*;—or with women who have ulcers,—or who have lately had connexion with one whose penis was ulcerated. But the strongest arguments of all are contained in two papers presented by Mr. Beckett to the Royal Society in 1717 and 1718, in which he contends for the antiquity of the disease in England. He proves that gonorrhœa was well known in 1162 under the terms *brenning* or *burning*;—and that certain enactments were extant which provided that any *stewholder* keeping a woman with the *perilous infirmity of burning*

* De Medicinâ, lib. vi. cap. 18.

should forfeit the sum of one hundred shillings. Further, he says that John Arden, surgeon to Richard II., (1380,) defines the *brenning* to be an *inward heat and excoriation of the urethra;* and that, besides, he mentions certain "*contumacious ulcers* which we now term *chancres.*" That a MS. in Lincoln College, Oxford, written by Thomas Gascoigne, Chancellor of that University, and dated 1430, states that some men (and amongst them John of Gaunt) had died of diseases caught by frequenting women. Another potent line of reasoning is founded on the circumstance, that many ancient authors state the *leprosy* of their times as being *contagious;*—and that *ulcers of the penis* and *heat of urine* were contracted by men who lay with leprous women. But it is reasonable to infer, that what they called *leprosy* was in reality *venereal disease.* Because, in the *first* place, (as Bateman says,) "there is little doubt that every species of cachectic disease accompanied with ulceration, gangrene, or any superficial derangement, was formerly termed leprous;"*—and because, in the *second* place, there is no ground for believing that *elephantiasis* (the real leprosy) is contagious at all;—and because that disease is never communicated by contact in modern times, whether in carnal conversation or otherwise;—a fact which has been ascertained by ample experience, especially at Madeira.† Mr. Beckett further mentions the occurrence of *nodes on the bones* at those early periods; and shows that some of the so-called leprous diseases were cured by mercury, whilst real leprosy is not. Therefore those who believe in the antiquity of the venereal disease contend, that discharges from the urethra and ulcers on the genitals were known in the earlier ages;—that they were known to proceed from fornication;—but that the secondary symptoms which followed them were, for the most part, not known to be venereal, but confounded with the leprosy.

(*b*) *Arguments against its antiquity.*—On the other hand, the opponents of its antiquity contend, that although ulcers or pustules on the genital organs and sundry discharges were not unknown;—still that neither in Celsus, nor in any other ancient writer, do we find mention that such maladies were *solely, or even frequently, the produce of sexual commerce;*—or that they were peculiarly *difficult to heal;*—or that they were frequently, or indeed ever, *followed by constitutional diseases.* But the most potent argument of all is this;—namely, that all at once, towards the close of the fifteenth century, whilst the French army was besieging Naples, a new and terrible disease sprung up;—rebellious to every known method of treatment;—attacking high and low, rich and poor;—sparing neither *age* nor sex;—consisting of ulcers on the

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* Bateman on Cutaneous Diseases, 5th ed., pp. 304 *et seq.*

† Mr. Bacot, and others who oppose the antiquity of the venereal disease, assert that leprosy is "*undoubtedly contagious.*"

parts of generation in both sexes; which were speedily followed by affections of the throat and nose;—by corroding ulcers over the whole body; by excruciating nocturnal pains, and frequently by death. Whereas, "not one word that can be construed into any similar affection, is to be met with distinctly stated in any writer before that period."

Those, therefore, who are in favour of its antiquity, must hold one of these three opinions concerning that virulent disease of the fifteenth century:—viz. 1st, That it was a *new kind* of venereal disease;—or, 2ndly, That it was merely an *aggravated variety* of the old disease;—or, 3rdly, That it was *not the venereal disease* at all; but some malady (such as *sivvens*, *yaws*, *radesyge*, &c.) resembling it. But the consideration of the history of this new malady brings us to our second question.

II. WAS IT IMPORTED FROM AMERICA?—The greatest weight of evidence is certainly opposed to this supposition. Because no such disease is mentioned by the *very earliest* historians of the discovery of that continent;—neither is it mentioned by the earliest writers on America;—and Peter Martyr, who was physician to Ferdinand and Isabella, and who was actually at Barcelona when Columbus returned from his first voyage in 1493, does not say a word as to its American origin. But besides;—of the earliest authors on the venereal disease, some attribute it to the *divine vengeance*, some to an *earthquake*, some to a *malignity of the air* caused by an overflow of the Tiber; not a few to a *celestial influx*, or *malignant conjunction of Saturn and Mars in the sign Scorpio*, or some other such astrological nonsense;—almost all refer its outbreak to the siege of Naples—but not one for the first thirty or forty years derives it from the West Indies.

Those who conceive that the new disease was *not syphilis*, found their opinion on the fact that the descriptions given by many of the oldest writers correspond pretty closely with the *yaws*, or *frambœsia* or *sivvens*, (a disease frequent enough in America,) and that like yaws it often was communicated to the *very young or old*, and to persons who did not catch it by carnal conversation.

III. ARE THERE MORE VENEREAL POISONS THAN ONE?—(*a*)—*Arguments for plurality.* These may be drawn, (1) *from history*; for *some poisons* causing venereal diseases existed from remote antiquity;—but a new venereal disease arose in the fifteenth century;—*ergo*, there are more venereal poisons than one. (2) *From the nature and phenomena of the disease.* The pluralists handle this argument thus. They say that every other morbid poison is *uniform and regular* in its effects; and that it would be "an unreasonable and unwarranted exception to an universal law of nature," if the venereal were not so also. But venereal diseases are *multiform* and *irregular*; consequently they must be caused by more poisons than one. They say also that primary ulcers possess distinct characters from their very commencement, and

that the different constitutional affections prove a plurality of poisons; for what other poison can produce papular, pustular, scaly, and other kinds of eruptions?

(*b*) ***Arguments against plurality.***—To these the non-pluralists answer truly, that in numberless cases different eruptions have arisen from the same sore;—that experience proves no general relation between primary and secondary symptoms;—that the differences of the primary sore depend on differences of situation, treatment, &c.;—and that if arguments in favour of multiplicity of poisons be drawn from the mere appearance of ulcers, there may be forty or fifty instead of four or five venereal poisons.*

IV. ARE THE POISONS OF GONORRHŒA AND SYPHILIS IDENTICAL?—or in other words, *Is gonorrhœa ever followed by secondary symptoms?* Hunter believed that they were identical. He produced a chancre by inoculation with gonorrhœal matter, which was followed in three months by sore throat and eruptions. Again, it is certain that chancres may be caught from women in whom no ulcers can be detected. On the opposite side, however, it is argued that B. Bell made many experiments like Hunter's with no such results;—and that we very rarely hear of secondary symptoms following gonorrhœa,—and that when they do, they are to be attributed to some unnoticed ulceration.

CONCLUSIONS.—From the foregoing details, and from various other facts on record, it may be concluded, 1st, That the venereal poison is most probably produced by the mixture of various foul and diseased secretions of the genitals.† 2ndly, That it occasionally is engendered *de novo* (*i. e. without infection*) in prostitutes and others. 3rdly, That although there are no distinct *species* of venereal poisons, yet that there are several *varieties*;—and that different varieties prevail at different times and places, the chancre of one generation being lost in the next. 4thly, That venereal diseases existed from the earliest ages;—and that the *syphilis* of the fifteenth century was a new and virulent variety generated among the military at the siege of Naples. 5thly, That diseases strictly resembling the venereal have been produced by causes not in any way connected with the generative system;—as in Hunter's cases of the persons so affected through transplantation of teeth.‡ 6thly, That some gonorrhœas are followed by secondary symptoms.

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* Carmichael enumerates *five*; Judd *nine*; which, however, he does not believe to be all that exist.

† Mr. Kingdon, at the *Lond. Med. Soc.*, related a case of venereal affection generated by a healthy man and his wife. *Lancet*, May 3rd, 1838. See also, Travers on the Venereal.

‡ A case of ulceration of the lip, followed by secondary symptoms, and caused by the irritation of *tobacco*, is related by Mr. Earle in the Med. Chir. Trans. vol. xii.

Lastly, *is mercury a specific?* Hunter not only considered that no really syphilitic disease could get well without it, but gravely upbraids human nature for doubting it. "Nothing," says he, "can show more the ungrateful and unsettled mind of man than his treatment of this medicine. If there is such a thing as a specific, mercury is one for the venereal disease." The following results, however, of experiments made by the army surgeons, and especially by Rose, Guthrie, and Hennen, will enable the reader to form a juster estimate of its capabilities. It is concluded, (1) That all kinds of primary and secondary symptoms *may* get well without mercury. (2) That out of 1,940 cases treated without it, ninety-six had secondary symptoms; and out of 2,827 treated with it, fifty-one had secondary symptoms. The average results of different experimenters, however, show that there are at least *seven times* as many secondary cases when no mercury has been given as when it has. (3) That the secondary symptoms of cases treated without it are in general less severe, and that affections of the bones in particular are much less frequent. (4) That the average period of cure is much the same in both cases; but that relapses are more frequent when no mercury has been given.*

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* Vide *Aphrodisiacus*, by Daniel Turner, M.D. London, 1736; a collection of the opinions of the early authors. *Hunter* on the Venereal; *Hennen's* Military Surgery; *Carmichael* on Syphilis; *Bacot's* Treatise on Syphilis; *Titley* on Diseases of the Genitals of the Male; *Wallace* on the Venereal, (*Plates;*) *Judd's* Treatise on Urethritis and Syphilis, (*Plates.*) The works of *Bacot* and *Titley* are the most comprehensive, straightforward, and practical. Some papers by *H. J. Johnson*, in the Med. Chir. Review, may be consulted with advantage. The work of *Mr. Judd* contains much information that is unique and of eminent value, particularly with regard to the ætiology of urethritis and the classification of eruptions. His opinions, however, of the *modus operandi* of mercury are rather hypothetical, and not exactly borne out by the results of his own experiments;—and his admiration of the iodide of potassium is rather too enthusiastic. He states, "when *small quantities of mercury were employed for only a few days*, so large and frightful a number as five cases of secondary symptoms out of ten was the actual result; that is to say, exactly one half had eruptions and other secondary symptoms;—which I attribute solely to the mode of treatment adopted causing an increased absorption, and to an amount that certainly would not have taken place without it." This inference is, however, rather invalidated by a precisely similar trial on ten primary cases, from which only two secondary resulted.

SECTION III.—OF GONORRHŒA.

SYN.—*Gonorrhœa virulenta; blenorrhœa venerea; urethritis venerea.*

DEFINITION.—A venereal gonorrhœa signifies an inflammation of the mucous membrane of the male urethra or female vagina, from the application of a morbid poison, most generally during sexual connexion.

SYMPTOMS *in Man.*—The patient first experiences a little itching or tingling at the orifice of the urethra, together with a sense of heat and soreness along the under side of the penis, and slight pain and scalding in making water. A little discharge soon exudes from the urethra: at first it is thin and whitish, but it gradually becomes thicker and more puriform; and, when the disease is at its height, is often yellow, or greenish, or tinged with blood. The penis swells, the glans is of a peculiar cherry colour, is intensely tender, and often excoriated. In consequence of the tumefied state of the urethra, the stream of urine is small and forked, and passed with much straining and difficulty, and with severe pain. Other symptoms and phenomena that appear in different cases are as follow.

1. *Long-continued and painful erections;* said sometimes to be so severe as to threaten mortification.

2. *Chordee,* a highly painful and crooked state of the penis during erection. Hunter says that there are two kinds of it—the inflammatory and spasmodic. The *inflammatory* arises from a deposit of lymph in the *corpus spongiosum urethræ,* which glues together the cells, and prevents their distension; so that when the penis is turgid with blood, it is bent at one part, and horribly painful. "The *spasmodic chordee,*" says Hunter, "comes and goes, but at no stated times; at one time there will be an erection entirely free from it, at another it will be severely felt; and this will often happen at short intervals."

3. Very commonly *tenderness or soreness* extends to all the *parts in the vicinity of the genitals;* to the groins, hips, inside of the thighs, perinæum, and testicles, so as to render the least motion insupportable.

4. There may be severe *irritation,* or actual *inflammation of the urinary organs;*—producing great pain in the perinæum, and spasm of the acceleratores and other muscles during micturition, so as to interrupt the stream of urine, and cause the most exquisite agony;—or irritation of the bladder, with very frequent desire to make water, and great pain in doing so, which lasts for some time afterwards, as though from spasm of its muscular coat;—or there may be pain in the loins, scanty urine, tenderness of the abdomen, vomiting, and other signs of severe irritation of the kidneys.

5. *Hæmorrhage* from the urethra;—which may be either an *exhalation* of blood from the distended capillaries, or an actual *laceration of the vessels* when stretched by violent erection. The loss of blood generally gives relief.

6. *Inflammation* and obstruction of the *mucous follicles* of the urethra, which may suppurate and burst either into the urethra, or externally; or both.

7. *Inflammation* of the *lymphatic glands* of the groin; constituting *sympathetic bubo.*

8. *Gonorrhœa spuria, vel externa*—inflammation and suppuration of the sebaceous follicles around the *corona glandis;* with or without excoriations.

9. *Phymosis*, or *paraphymosis*, may easily arise, owing to the swelled condition of the *glans* and prepuce. When the latter is œdematous, it presents a curious semi-transparent appearance called *crystalline.*

Varieties.—Gonorrhœa varies extremely in its severity. It is always most severe in first cases, and in patients who are very young, or who possess irritable or scrofulous constitutions. In such cases it may be attended with extreme fever and constitutional disturbance, and may even prove dangerous to life by leading to extensive abscesses in the neighbourhood of the bladder.*

But, after repeated attacks, the urethra becomes as it were inured to the disease, and each subsequent infection is more trivial. In these cases the discharge is the first symptom, and precedes the pain and scalding. In some rare instances, the constitutional affection is extremely anomalous, and characterised by severe and continuous rigors.

Morbid Appearances.—On dissecting a urethra affected with recent gonorrhœa, the mucous membrane is found red and swollen, and the follicles or *lacunæ* enlarged and filled with pus. The inflammation appears always to be most vivid near the orifice, and, except during the most acute stage, does not extend more than two or three inches from it. It has been stated that although *inflammation* may extend further, (into the bladder for instance,) yet that such inflammation is not *specific;* but this seems to be a purely gratuitous hypothesis.

Diagnosis.—The diagnosis of gonorrhœa is often a matter of great difficulty, but of great importance to the character and comfort of the patient. Now, inflammation of the urethra, with purulent discharge, may arise from many other causes besides venereal infection, and we may divide all cases of it into three classes.

1. Discharges excited by some local or constitutional cause, altogether independent of any morbid poision.

2. Discharges contracted through sexual connexion, and excited

* For cases, *vide* Judd, op. cit. p. 70.

by some morbid poison in the female ;—which morbid poison, however, is produced by some *idiopathic* disease of the female, and not by any disease acquired through impure connexion.

3. Discharges *really venereal ;* that is, which have been excited by disease in a female, who was previously infected by a similar discharge from a third party.

I. *Of the first class.* (*a.*) In the first place, discharges simulating venereal gonorrhœa may be caused by *local violence.* The author some time ago treated a most obstinate case of this description, brought on by galloping several miles on a horse without a saddle. The patient was a married gentleman, with a constitutional tendency to irritation of the mucous membranes ; during the treatment he suffered from a severe attack of acute rheumatism. The introduction of bougies ;—blows on the perinæum ;—violent bending of the penis during erection ;—and long travel in a jolting vehicle over bad roads, are well-authenticated causes of similar cases.* (*b.*) Urethritis with discharge may be produced by various *disorders of the constitution.* It has been a symptom of *rheumatism ;* and not unfrequently it precedes a paroxysm of *gout.* It may be caused by *sympathy with irritation of other parts.* Thus it may be occasioned by *piles ;*—and it has been known to accompany the cutting of a tooth several times in the same patient. (*c.*) A discharge is liable to occur in patients affected with *stricture ;* —and to recur in those who have been long habituated to it, upon any neglect of their health, or *inordinate fatigue,* or *excess in food, wine, or venery.* (*d.*) Lastly, discharges are sometimes (although rarely) occasioned by the *use of particular medicines. Guaiacum* has been named as one.

The grand diagnostic sign laid down by writers,† whereby to distinguish non-venereal discharges (or *simple gonorrhœa*) from *venereal gonorrhœa,* is the comparative mildness of the former, and the absence of acute inflammation. But this, although frequently, is by no means invariably the case. And the author can testify that in some of the non-venereal cases, the pain, scalding, and other inflammatory symptoms may be of great severity, and of long continuance, and that they may be followed by rheumatism, which is so frequent a consequence of genuine venereal gonorrhœa. But if the patient strongly deny that his malady can arise from impure connexion ; and if his character place his statement above suspicion ;—if the existence of some one of the foregoing causes can be ascertained, and especially if it be known that he have suffered from it before in like manner ;—it will be right to pronounce the case *not venereal ;* and more especially if the patient be married, or be in circumstances which would render any imputation on his continence either disgraceful or ruinous. Again, if,

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* *Vide* Judd, op. cit. p. 32. † Titley, op. cit. p. 186.

as Mr. Bacot observes, "a discharge come on only a few hours after connexion; and if it have continued several days without inflammatory symptoms; if the patient has been liable to some discharge after any excess of venery or of wine;—in all such cases the probability is, that the patient labours under some other diseased condition of the urethra, and that although the intercourse of the sexes may have been the exciting cause, still there may be no imputation on the cleanliness of the female."*

II. The *second class* comprises those *discharges which arise from morbid poisons applied during coition*, (such as various diseased secretions,) but which *diseased secretions do not result from former impure connexion.* (*a.*) The *menstrual fluid* is capable of causing urethritis with violent scalding and chordee, and followed by swelled testicle;—and a considerable degree of irritation has been produced by the vaginal secretions, just previous to menstruation.† (*b.*) Similar consequences sometimes ensue if the female be affected with *leucorrhœa*, or with any other discharge of any sort whatever.

These cases can only be judged not to be venereal, by a knowledge that the causes we have mentioned, and no others, were concerned in their production. And if the character of the female is suspicious, it must be determined by an examination.

III. The *third*, or *really venereal* class of cases, namely, *discharges communicated by a female who has been previously infected by a similar discharge*, comprises many sorts of disease; some one or more of which may doubtless be followed by genuine secondary syphilitic symptoms, although it is impossible to distinguish them except by the event.‡

But it is most important to observe, that although discharges may arise from many causes besides connexion, and although all the discharges that do arise from connexion are not venereal, yet that every one of them is capable of exciting a similar discharge in a healthy person, and that consequently as much caution should be used not to risk their propagation, as though they were really venereal.

These observations will go far towards solving another question that is frequently asked, viz. What is the danger of conveying infection when the discharge is very small in quantity, or when it is merely gleety and mucous? It is most true that many persons will escape, and that the danger of infecting may not be great. But still it is the surgeon's duty to inform his patient of the probability of danger;—which will of course be greater if the discharge were originally venereal, and has not ceased since its origin, than

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* Bacot, op. cit. p. 101 † Judd, op. cit. p. 24.

‡ Besides the cases in which chancre exists within the urethra, as recently stated by Colles, Johnson, and others.

if it had ceased, but had been renewed by some accidental circumstance.

If, however, the patient be determined to run the risk, he should at all events cleanse the urethra first by making water and syringing it thoroughly with a mild astringent lotion.* It is a well-established fact, that the contact of matter is indispensable to the propagation of the disease; consequently, by removing the matter, the hazard will be diminished. A person may have received the infection, but cannot communicate it previous to the appearance of discharge.

The *time at which the disease commences after infection* is generally the third or fourth day; in some cases within twenty-four hours; in others, not for four or six weeks, although preceded by uncomfortable sensations in the urethra.

CONSEQUENCES.—1. The most frequent consequence of gonorrhœa is *gleet*, a catarrh or mucous discharge from the urethra. It is a most obstinate malady, and often depends on a morbid state of the passage.

2. *Inflammation of the testicles*, especially the left.

3. *Strictures*, spasmodic and permanent.

4. *Irritability of the bladder.*

5. A *scirrhous* (i. e. *hard*) state of the *corpus spongiosum urethræ*, which acquires an almost cartilaginous density, and may in adddition be contracted in various parts, so as to prevent erection.

6. *Gonorrhœal ophthalmia.*

7. *Gonorrhœal rheumatism.* Pain, slight swelling, and tenderness of the joints, especially the knees and ankles, and fever; occurring most frequently towards the termination of a gonorrhœal attack in young men of a delicate or strumous habit. This affection has been attributed to the use of copaiba or cubebs;—but although they may perhaps be predisposing causes, yet the rheumatism has occurred in cases in which no medicine whatever had been taken.

8. *Eruptions*, sore throat, and other affections commonly termed *secondary syphilis;* but which of a certainty do sometimes follow gonorrhœa.

GONORRHŒA IN THE FEMALE.—This, unless the patient is very young and delicate, is a much more simple disease than it is in the male; since the parts affected are less complex in formation, and less important in function.

The *symptoms* are much the same. Heat and pain in making water; tenderness and soreness, especially in walking, uneasiness in sitting, and muco-purulent discharge. On examination, the parts are found swelled and red, and if the case is severe, there may be

* Titley, p. 194.

excoriations or minute aphthous ulcerations. Sympathetic enlargement of the inguinal glands, and abscesses in the mucous follicles, are occasional complications.

DIAGNOSIS.—This in a female is often extremely difficult;—because discharges may arise from many other causes besides venereal infection;—because discharges not themselves venereal may communicate disease to the male;—and because if the patient be scrupulously cleanly and use injections, it may be almost impossible to say whether she is cured or not. *Acute inflammation of the vaginal mucous membrane*, from whatever cause induced, has precisely the same symptoms as acute gonorrhœa. It may occur in the youngest children from local violence of any sort; or from sympathetic irritation;—teething, costiveness, worms, or any other disorders of the alimentary canal.

Leucorrhœa or *fluor albus*, may in general be distinguished by the absence of heat or pain in micturition; and by the pain in the back, pallid countenance, irregular menstruation, and signs of exhaustion and debility which generally accompany it. Yet a profuse gonorrhœal discharge will cause the same appearances. If, therefore, a woman has a discharge, or has communicated one, and the surgeon is desired to pronounce whether venereal or not, he must be guided chiefly by the moral and circumstantial evidence, and be very cautious not to give unnecessary pain by a hasty decision amidst so many conflicting circumstances.

TREATMENT.—*Prophylactic.* There is reason to believe, that in most instances in which the venereal disease is caught, it is through the negligence of the patient. If he were to make water, so as to cleanse the urethra, and then perform a thorough ablution with soap and water, it would scarcely be possible for him to retain the infection;—provided that there were no fissures or excoriations about the organ, which would of course greatly aggravate the danger of syphilis. There are various remedies proposed as preventives;—oil smeared on the parts might be of some service, and weak lotions of corrosive sublimate, or of liquor potassæ, would tend to decompose any virus that might adhere to the parts; but nothing can be safer than free ablution, and nothing can be efficacious without it.

Curative.—The indications are, to remove excess of inflammation by antiphlogistic measures, and subsequently to alter the action of the affected part by certain stimulants and astringents.

If it be a first case, and the symptoms be severe, the patient must be confined to his bed or sofa. The penis and scrotum should be raised by a suspensory bandage, and a cold lotion should be constantly applied, if agreeable. The glans should be protected from irritation by a piece of lint well covered with simple ointment. The diet should be low, and the patient should drink plentifully of soda water, or effervescing saline draughts, together with

barley-water, gum-water, linseed-tea, and other mucilaginous fluids, both that the acrimony of the urine may be lessened by dilution, and that irritation may be soothed by their demulcent quality. With the same view he may take alkaline medicines in combination with hyoscyamus and demulcents. F. 19 is a good prescription for such cases. But it must never be forgotten that the dose of alkali cannot be increased beyond a certain point without rendering the urine thick, whitish, and more irritating than before. The bowels should be opened by a single dose of calomel at night, followed by castor oil or the black draught in the morning, and they should be kept open; but *free purging* is most useless and mischievous; the griping and straining at stool add to the local irritation, and the patient being weakened is more liable to a long and troublesome gleet. After the bowels are opened, it is advantageous to give ten grains of Dover's powder with half a grain of tartar emetic and three of ext. conii at bedtime. Or F. 7 will answer a similar purpose; that, namely, of allaying irritation without checking the alvine secretions.

If the patient be very plethoric and full blooded, and if he suffer greatly from pain and fever, and has a hard pulse and white tongue;—or if there be tenderness of the abdomen, pain in the back, or other signs of irritation of the urinary organs, it will be right to take blood from the arm; or at all events to bleed locally, by *cupping* or *leeches to the perinæum*. Leeches should not as a general rule be applied to the penis, because they may irritate the skin, and cause œdema of the prepuce with phymosis. In similar cases it will be right to administer calomel and antimony pretty freely till the inflammatory symptoms abate.

When the acute stage is subsiding, which (except in very severe cases) will happen in about a week;—or if the symptoms from the first are very mild, (as they will be after repeated attacks,) the *second indication* may be acted upon, viz. to alter the capillary action of the parts; and this is to be effected both by internal and external remedies.

The chief internal remedy is *copaiba*, which contains a highly pungent volatile oil that is absorbed into the blood, and then eliminated by the kidneys and mucous membranes, especially the pulmonary; so that its peculiar *fragrance* is detectable in the breath long after it is swallowed. It is best exhibited in the form of an emulsion, (F. 20,) in doses of ℿxx, gradually increased to 3i. When tenderness of the urethra and chordee are subsiding, a weak *injection* may be used, consisting of liq. plumbi diacetatis, fʒß tinct. opii fʒß, and aq. rosæ fʒiv, mixed at the time of using with an equal quantity of warm water. As the tenderness and other inflammatory symptoms abate, the injections may be increased in strength, and used more frequently; those of acetate of zinc, (F. 21,) or of sulphate of zinc, (gr. ii. ad ʒi.,) are most employed. It must be recollected that if a weak injection be used

frequently, it will do most of the good and none of the mischief that a stronger one might. It will be known to do harm if the tenderness, pain, and scalding increase; or if the patient has rigors. Injections require to be frequently varied. Formulæ 21, 22, 23, may be tried in their turn. By these means, in the course of two or three weeks, the pain and scalding will mostly vanish, and nothing be left but a glairy discharge or gleet, mixed with a little pus in the morning; and at this stage the patient and surgeon are apt to relax in their assiduity, whereas it ought to be doubled. For the purpose of removing this relique of the disease, the patient's health and strength must, if impaired, be restored by tonics, good living, and cold bathing, avoiding all excess of food, wine, or fatigue, and especially of venery. If he can be brought to refrain altogether from the last indulgence, so much the better. At the same time the copaiba must be continued, and should be very gradually left off, even when the discharge has altogether ceased. Two drachms of *kino*, combined with F. 20, is an excellent remedy. If the patient is tired of taking the balsam in a liquid form, it may be combined with equal parts of calcined magnesia and pulv. gallæ till it becomes solid, and can be made into pills. Or it may be taken in the *gelatinous capsules*, or may be solidified by pure magnesia, and then be rolled into oval boluses, which can be covered with very thin paper. The best method of avoiding the taste of this, as of other nauseous medicines, is to eat a piece of extract of liquorice previously. *Cantharides* is a very potent remedy for obstinate gleet; it may be given with great advantage in combination with zinc. sulph. and Venice turpentine, or with the solidified copaiba; or the tincture may be added to F. 20. It will be advisable, in cases of gleet which do not yield to medicine or injections, to pass a bougie, which, as Mr. Bacot observes, should be of smooth metal, and large enough to fill the urethra without stretching it. It should be passed about twice a week; and the patient should be informed that it may perhaps increase the discharge for the first day or two. No patient with gleet ought to be in haste to release himself from the surgeon's hands, or to shake off the trammels of strict regimen.

The *cubeb pepper* is a remedy of similar virtues to copaiba, and is preferred by some practitioners. It may be given instead of it, in doses of one or two drachms *ter die*, and combined with soda and nitre, if there be any scalding. Both these remedies are capable of producing very unpleasant effects. They may purge and gripe excessively;—in which case a laxative of rhubarb and magnesia, followed by chalk and opium, should be given;—and the copaiba, or cubebs, when again resorted to, should be administered in small doses, combined with opium or hyoscyamus. Sometimes they cause great fever, with furred tongue, sickness, headache, and a rash;—which may be removed by low diet and laxatives, with care to avoid cold. Many attempts have been made to diminish

the nauseous taste of these medicines, and especially of copaiba, by weak alkaline solutions or extracts;—but this object is never attained without a sacrifice of their efficacy. The solution of chloride of lime has been used as a substitute, in doses of ♏x.—xxx; but it has not proved of much efficacy.

VARIOUS REMEDIES.—We have now detailed the best established and most successful treatment;—but some authorities from the very first pursue no other than the stimulant plan, both locally and generally. The copaiba and cubebs have been recommended in very large doses from the first, without waiting till the inflammatory stage has ceased; but although this plan has proved highly successful in a few cases, it has in others caused extreme fever, pain in the loins, bloody urine, strangury, and other symptoms of irritation of the kidneys or bladder. In the same manner attempts are sometimes made to supersede and prevent the disease, as soon as the first symptoms are perceived, by strong astringent injections, especially of the nitrate of silver, in the strength of ten or twenty grains to an ounce of water. This plan would be very hazardous in irritable habits. When the patient is *habituated to the disease*, and discharge precedes pain and scalding, an injection will often suppress it in a few days, without further trouble.

TREATMENT OF COMPLICATIONS.—*Painful erections* are to be treated by cold, and opiates at bedtime. *Bleedings*, by cold, and pressure of the bleeding point if it can be found. *Chordee*, by cold, and opium at bedtime, to prevent erection; by leeches, to abate inflammation;—and subsequently by friction with camphorated mercurial ointment, to cause absorption of the lymph. A tube may be carried under the bedclothes to convey a current of air to the affected part. Opiate-clysters, camphor, hyoscyamus, and conium, and ointments or liniments containing camphor or belladonna, are excellent adjuncts. The *spasmodic chordee* is said by Hunter to be chiefly benefited by bark. The application of cold is sometimes painful, especially if there be widely spread tenderness of the thighs and perinæum, or if the bladder and kidneys are affected. A warm hip-bath, with a dose of Dover's powder at bedtime, should then be given.

Inflammation of the mucous glands of the urethra must be treated with leeches and poultices, or cold lotions;—if necessary, an opening must be made, but it should be avoided if possible. *Excoriations* and discharges from around the *corona glandis* may be cured by perfect cleanliness and mild astringent lotions. *Phymosis, paraphymosis, and swelled testicle*, will be treated of elsewhere. Rest and few leeches will in general suffice for swelling of the inguinal glands.

TREATMENT OF CONSEQUENCES.—(*a*) A *scirrhous or semi-cartilaginous condition* of the corpus spongiosum urethræ is always extremely difficult to get rid of. The frequent introduction of bougies, and friction with mercurials, alternating with iodurettted

ointments,—warm bathing, and the internal use of Plummer's pill and iodine, afford the best chance of relief.* Cases are recorded in which portions of osseous matter have been removed from the septum penis by incision.†

(*b*) *Gonorrhœal rheumatism* must be treated on the same principles as common rheumatism;—if severe, by bleeding; otherwise the bowels should be well cleared by calomel and black draught, and then colchicum should be given in doses of ♏xx. of the wine, with magnesia, every four or five hours, and a dose of Dover's powder at bedtime. In the chronic stage, F. 7 at bedtime;—sarsaparilla, bark, volatile tinct. of guaiacum, sea air, tonics, and warm bathing.

Papular eruptions, sore throat, &c., must be treated as the same disorders when following ulcers.

The treatment of gonorrhœa in the female must be conducted upon precisely the same principles. During the early stage, rest in the recumbent posture, leeches, anodyne fomentations, frequent ablution, lubrication with lard or cold cream—and demulcents;—with laxatives, and diaphoretics, are the measures to be adopted, until heat, pain, and tenderness subside; afterwards injections may be used with much greater freedom and benefit than in the other sex. Those of acetate of zinc and nitrate of silver appear to be the best; and they should be continued for some time after all discharge has ceased. But much greater liberties may be taken with the vagina than with the male urethra; and the disease may often be stopped at once, without risk, by the application of the solid nitrate of silver, as recommended by Jewel and others. It should be applied, however, either *before* the inflammatory symptoms have attained any height, or after they have subsided. *Terebinthinate medicines* (copaiba, &c.) may be given, although they do not do much good. Abscesses or other complications are rare; but if they occur, they must be treated on general principles.

SECTION IV.—OF PRIMARY VENEREAL ULCERS.

GENERAL DESCRIPTION.—Primary venereal ulcers may be caused by the application of the venereal virus to any surface, mucous or cutaneous, entire, wounded, or ulcerated. Their most frequent *seat* is the genitals;—and in men they are more frequently than otherwise found on the inner surface of the prepuce, or the furrow

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* The author witnessed a very severe case of this description, treated by Mr. Challice, of Bruton-street. By the assiduous use of the measures indicated above, the natural use and shape of the part were restored in about three months.

† Titley, p. 175.

between the prepuce and corona glandis, or the angle by the frænum;—obviously because those spots are most convenient for the lodgment of filth. It is notorious that persons with a long prepuce, whose glans is habitually protected by it, and covered with a delicate semi-mucous membrane, are more liable to suffer than those whose glans is uncovered and clothed with a denser cuticle. The *time* at which venereal sores appear is usually from the third to the tenth day; but they have appeared so early as twenty-four hours, and so late as seven weeks after infection.

DIAGNOSIS.—It is not always easy to decide at first sight whether any sore on the genitals is venereal or not. The grand criterion is, that venereal sores, if treated merely with simple applications, and not interfered with by caustic, are extremely obstinate to heal; and that they cannot be attributed to any local irritation, or defect in the general health. The *breaches of surface most liable to be confounded with them* are as follow.*

1. *Excoriations*, patches on the glans, or corona glandis, or inner surface of the prepuce, which look as if the cuticle was peeled off, but have little or no redness or inflammation; they often discharge profusely, and occur in persons whose prepuce is long, or who neglect cleanliness. There may or may not be any suspicion of venereal infection. If not, common ablution, and any mild astringent will suffice; such as powder of calamine stone, or oxyde of zinc, or very weak saturnine lotion, or zinc lotion. Slight *fissures* or *cracks at the edge of the prepuce* may arise from distension during connexion; but, if not infected by any poison, will soon heal; and they will be known from venereal sores by appearing *immediately* after connexion. Excoriations will be known by their want of depth. But both these simple affections may become the seat of venereal action, as will be mentioned among the varieties of venereal sores.

2. *Minute aphthous-looking points*, sometimes in clusters, sometimes surrounding the glans; some of them healing, whilst others break out. They are totally devoid of pain; and, although they may last a long time, do not lead to ulcers. They are best treated by washes of *arg. nit.* or *cupr. sulph.* and alteratives.

3. *Herpes præputialis*† begins with extreme itching and sense of heat. The patient examining the part finds one or two red patches, about the size of a split pea. On each patch are clustered *five or six minute vesicles*, which, being extremely transparent, appear of the same red colour as the patch on which they are situated. In twenty-four or thirty hours the vesicles become larger, milky, and opake; and on the third day they are confluent and almost pustular. If the eruption is seated on the inner sur-

* Bacot, p. 153; Titley, p. 160, *et seq.*

† Bateman on Cutaneous Diseases, fifth edition, p. 238.

face of the prepuce, the vesicles commonly break on the fourth or fifth day, and form a slight ulcer with a white surface and rather elevated edges. If this ulcer be irritated by caustic or otherwise, its base may become as hard as that of a chancre. If left to itself, it mostly heals in a fortnight;—sooner if situated on the external skin. The *cause* of this complaint is either some derangement of the digestive organs, or irritation within the urethra, which should be ascertained by the bougie. It is very liable to recur in the same individual, which of course, if known, will greatly aid the diagnosis.

Treatment.—A little dry lint, or goldbeater's skin, at first, and subsequently a very weak saturnine lotion. This affection, as well as the following, may lead to bubo.

4. *Psoriasis præputii*, painful, irritable and bleeding cracks or fissures around the edge of the prepuce,—best treated by ung. hydr. nitr. dil.

VARIETIES.—The varieties of venereal ulcers may depend, (1) On *varieties in the poison* by which they were caused;—some varieties being more prevalent than others in particular places and at particular times. (2) On the *local treatment.* (3) On the *state of the constitution*, from which seems to arise the most practically important modification of all: viz. the *degree of inflammation with which the sore is attended.* (4) The *situation.* Sores on the glans are always deeper and more liable to become phagedænic than elsewhere, and do not throw out fungous granulations like those on the prepuce. The attempt to collate the different varieties spoken of by authors; to reconcile them with each other, and with what is seen in actual practice, shows the impossibility that there can exist any well-defined *species;* pursuing definite courses, and followed by definite secondary affections. If it were really so, men would no more differ about them than they do about the seven colours. But as it is, we have Hunter describing *one*, Carmichael *four*, Mayo *four*, Judd *nine*, Bacot *four*, Titley *six*, and Johnson* *five*, sorts of sores; and no two of these classifications agree. The following appear to be the best-marked varieties.

1. The *Hunterian chancre; Ulcus induratum*, (Evans;) *Sloughing ulcer*, (Bacot;) *Indurated ulcer*, (Auct. Var.)—This form of sore, to which precedence is given from its classic associations, is not very commonly met with;—although more frequently at present than ten or twenty years ago. It may begin either as a pimple, or as a patch of excoriation which heals up, leaving the centre ulcerous. It is nearly circular;—deep and excavated; the base and edges are hard as cartilage, but the hardness is circumscribed;—there is little pain or inflammation;—its colour is livid or tawny;—it is never so hard or excavated when on the body of the penis as on the glans.

* Med. Chir. Rev. 1837.

2. *Common Venereal Ulcer.*—Under this term may be included the numerous minute varieties described by authors;—for instance, the *ulcer "with no very remarkable characters,"* said by Carmichael to belong to the papular venereal disease;—and the *more inflamed ulcer*, which he says belongs to the pustular venereal disease;—the *raised ulcer of the prepuce*, and so forth. It may be said to have four stages. In the 1st, it is a small itching *pimple* or *pustule*, which bursting, displays,—2ndly, a foul *yellowish or tawny sore*, attended with slight redness and swelling, and spreading circularly. It may or may not be covered at first with a dirty brown scab. In the third stage it throws out indolent fungous granulations;—(except it be situate on the *glans*;) and is usually stationary for a little time after it has ceased to ulcerate, and before it begins to heal. In the 4th stage, it *slowly heals;* cicatrisation being preceded by a narrow vascular line. The cicatrix is often red and indurated;—swelled, if on the prepuce; but depressed, if on the glans, from want of granulations. It is exceedingly liable to re-ulcerate. If the ulcer be seated near the frænum, it is almost sure to perforate it.

One *sub-variety* has been termed by Mr. H. J. Johnson* the *multifarious sore*;—because the discharge is so infectious that it excites fresh ulcers on the sound skin. Another sub-variety is described under the term *excoriation sore*, *aphthous sore*, or *superficial sore*; a circular, shallowish sore, much resembling an excoriation, not ulcerating deeply. Finally, an *excoriation* or a *fissure* of the prepuce may be infected, and may be followed by secondary symptoms. But if ulceration does not spread, it will be very difficult to say whether it is a venereal ulcer, or merely a common fissure or excoriation obstinate in healing. In both cases it may appear yellowish and indolent.

3. The *Gangrenous or Sloughing Ulcer*, and,

4. The *Phagedæno-gangrenous* or *Phagedænic Ulcer*, are examples of venereal sores complicated with various grades of inflammation, or sloughing, or phagedæna;—which may be excited in these cases by the same means as they may in any others. Thus (*a*) *acute inflammation and sloughing* may be caused in the healthiest habits by *local irritation*—violent horse exercise, for instance. The penis is much swollen; there is great pain; with headache, thirst, white tongue, full hard pulse, and fever. (*b*) *Sloughing Phagedæna* (exactly resembling *hospital gangrene*) may be induced in any sore, if the constitution be irritable;—worn out by repeated debauchery, night watching, exposure to cold and damp, or by the profuse administration of mercury, or by confinement in the foul pestiferous air of an hospital. Hence it is liable to occur in soldiers, sailors, prostitutes, and bakers;—the last (respectable)

* Med. Chir. Review, March, 1834.

class of individuals being obliged to work in the night. (*c*) *Sloughing phagedæna* may be induced by some *peculiar acrimony of the venereal virus;* more especially if the circumstances last mentioned are superadded. The *Black Lion of Portugal* was a sore of this description. The venereal secretions of the Portuguese women appear to have been horribly deleterious to the British soldiers who cohabited with them during the Peninsular war. The venereal diseases picked up in some of the low districts of London, especially Whitechapel, are very virulent. It is believed that intercourse between foreigners generally gives rise to a destructive species of infection.* (*d*) *Phagedænic sores* spread rapidly, and are yellow and lardaceous. It is to be noticed that the three last sub-varieties (*b, c, d,*) may be attended either with an *acute inflammatory*,—or with an *asthenic, irritative, or typhoid* form of constitutional disturbance;—more frequently the latter.†

Venereal Ulcers in the female require no distinct observations. They do not usually cause so much distress as in the male, but they are very slow in healing, especially if interfered with by the urine.

SECTION V.—OF THE TREATMENT OF PRIMARY ULCERS, AND OF THE INFLUENCE OF REMEDIES GENERALLY.

The general indications in the treatment of venereal ulcers are, 1st, To obviate inflammation and fever. 2ndly, To maintain the general health, and prevent debility or irritability. 3rdly, To eradicate the venereal poison from the system.

In simple cases.—The *local treatment* cannot be too soothing during the early stages, and whilst ulceration is spreading or there is any pain. Weak *black wash* with lint, or a *bread and water poultice*, or any simple ointment, will then suffice. Afterwards, during the indolent and granulating stages, the arg. nit. occasionally, and black wash. Some persons recommend the early application of caustic, so as to destroy the sore, and prevent its local and constitutional consequences;—but this plan is objectionable in two points of view. In the first place, it is very apt to be unsuccessful, because absorption may have taken place beforehand, and so it would place the patient in a state of false security;—in the second place, it is often mischievous, aggravating the local inflammation and causing bubo. So that, if done at all, it should be as soon as the least pimple is perceptible; and the greatest care should be

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* Travers on the Pathology of Venereal Affections.

† The author need not here repeat the characters of these sloughing and phagedænic sores. They are amply described in the Chapter on Ulcers, page 74.

taken to counteract inflammation. A better plan is, that of *cutting out the ulcer*, but it is nearly as objectionable.

The *Constitutional Treatment* will consist in the exhibition of a proper course of mercury, provided that the case be really venereal, and that there are none of the contra-indications that will be mentioned presently. Before doing so, it will be necessary to prepare the patient;—and the proper *preparation for a mercurial course* consists merely in the regulation of the general health. It will be right to open the bowels by blue pill and black draught;—to prescribe low living, rest, and saline medicines, *till local pain and inflammation and any general disorder of the system have been removed.* A *warm bath* or two may also be useful. If the patient be young, plethoric, and a countryman, it may be right to *bleed* him; but great care must be taken not to induce weakness;—and neither this nor any other measure should be needlessly adopted from motives of mere routine.

Then the object is to induce a *gentle* mercurial action, and to maintain it *long enough.** Five grains of blue pill should be given every night and morning; and if no effect on the mouth is produced by the fourth day, the dose at night should be doubled. This will rarely fail, in another day or two, to produce the desired effect;—viz. *slight soreness and sponginess of the gums*, with a *slight* increase of the saliva. It must be observed, that the only *use of salivation* is to show that the system is affected. It should be steadily maintained for four or five weeks, and until the sore has healed and all hardness of the cicatrix has vanished. If the mouth become *too sore*, the dose should be lessened;—if the soreness *subside too soon*, it may be increased; or two or three doses of calomel may be added. Meanwhile the patient should live regularly, but not too low;—he should avoid all excess of food or wine, and acescent vegetables, and everything likely to disorder the bowels;—his clothing should be rather warm, so as to keep the skin perspirable;—and, above all, he should most sedulously avoid fatigue, cold, wet, and night air.

The *strong mercurial ointment* is not so likely to disorder the bowels as the blue pill, but it is more troublesome, and might fatigue a feeble patient injuriously. The dose is from ʒiß—ʒj;—to be rubbed in daily upon the inside of the thighs or arms till it disappears. The morning is the best time for doing it, as the skin is then softer; it should be rubbed on different limbs successively; the patient wearing the same drawers both by night and day. If the skin becomes irritated, it should be well washed and bathed. If the patient be too weak to rub in himself, it must be performed

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* The *principal errors to be avoided* are; beginning with the mercury *too soon*; giving it in *too large doses*; rendering salivation *too violent*; and desisting from it *too early*.

by a servant, whose hands should be protected by a pig's bladder, well softened in oil and tied round his wrist. If *calomel* is preferred, two or three grains may be given every night; but it is more apt to purge, and should only be used in cases where that effect would not be objectionable.

THE ILL EFFECTS OF MERCURY that require to be guarded against are as follow: 1. *Griping and purging*;—which are to be obviated by combining a small quantity of opium or hyoscyamus with the blue pill, and giving occasionally a draught with P. rhæi ℈j, tinct. ejusd. f℥j, tinct. opii ♏xx, aq. menth. f℥x. It is far from uncommon for a slight attack of *dysentery* to occur, especially about the time that salivation commences; there being sickness and severe griping, with frequent straining and ineffectual attempts to go to stool. This should be treated by the draught just mentioned, followed by opiate enemata and the warm bath;—the mercury being omitted for the time.

2. *Sore throat;* redness of the whole fauces, and sloughing or ulceration of the tonsils with fever. In this case the mercury must be discontinued, till leeches, gargles, and aperients have set the throat to rights;—and then it may be resumed in smaller doses.

3. *Violent salivation.* This may be caused by a too liberal use of the remedy; or by a sudden check to the cutaneous secretion by cold and damp. It is, however, very common to meet with persons who are salivated by the smallest quantities conceivable; and every practitioner should make a point of ascertaining this, before he prescribes mercury for any new patient. The *symptoms* of severe salivation are, swelling and inflammation of the salivary glands, cheeks, tongue, and fauces, with a flow of peculiarly fetid saliva, and ulceration or even sloughing of the gums. The best *local applications* for this state are, a few leeches to the Stenonian ducts on each side;—and gargles of brandy and water, to which a little of the solution of chloride of lime may be added (℥ii ad Oß.) The bowels should be cleared by mild aperients; and as soon as fever has abated, the patient should have a good diet and tonics, F. 1. Change of air, and especially removal from the venereal wards of an hospital, are indispensable. Other gargles may be made of honey and vinegar;—alum, dilute sulphuric acid;—nitre;—nitric or muriatic acids much diluted;—borax;—astringent vegetable decoctions;—iodide of potassium, &c. If the salivation be very obstinate, repeated blisters should be applied behind the ears, and to the throat.

4. *Eczema mercuriale* (*Eczema rubrum, Erythema mercuriale*) consists of patches of redness and inflammation, which appear first in the groins, axillæ, and flexures of the limbs, and then spread over the trunk. These patches are covered with minute vesicles, which soon burst, discharging a thin acrimonious fluid, and leaving the surface excoriated, and exceedingly painful and tender. The discharge often becomes profuse and fetid, and the affected parts much

swollen and fissured. It generally lasts for ten days, but may remain for many weeks. *Treatment.* Warm bathing, mild and unctuous applications, aperients, diaphoretics, salines, and opiates, during the early stages;—subsequently, bark or sarsaparilla, and the mineral acids. Dr. Colles has described another and less severe form of eruption, which resembles the itch, except that the intervals between the fingers are free from it; the treatment is the same. When a *patient who is disposed to these affections reverts* to the use of mercury, the doses should be small, combined with hyoscyamus, and he should carefully avoid heat, violent exercise, and everything else that excites the cutaneous circulation.

5. Erethismus mercurialis is a horrible affection, consisting in a tendency to palsy of the heart. There are great depression of strength; anxiety about the præcordia, dyspnœa, frequent sighing, weak and tumultuous action of the heart;—frequent sense of suffocation, disturbed sleep, and faintness upon any exertion; which faintness may prove fatal. *Treatment.* Removal to a fresh atmosphere; stimulants; tonics; and good living.

If during the mercurial course any *febrile or inflammatory attack* arises, it is a general rule to discontinue it until such a state has been removed. And if the *patient become thin and feeble;* losing his appetite and strength; complaining of disturbed sleep, night sweats, cough, or any other symptoms indicative of debility, his diet must be generous, and sarsaparilla or cinchona and other tonics must be liberally administered;—and if these symptoms persist, notwithstanding the mercury is given in diminished doses, it must be relinquished altogether.

If the *patient is very easily salivated*, the doses must be very small at distant intervals, and the strength must be well supported by tonics and good living. If, on the other hand, as sometimes happens, the *mercury seems to make no impression* on the system, the patient may be bled and purged;—should use the warm bath, and live low. But the doses must not be very much increased, lest they suddenly induce violent salivation, or the *erethismus.*

There are some *patients whom it is scarcely advisable to subject to a mercurial course*, viz. those actually labouring under, or strongly disposed to, *consumption* or *scrofula;* or who are extremely debilitated, or who are liable to the erethismus.

For these and other cases in which mercury is unadvisable, the *iodide of potassium* has been proposed as a substitute; in doses of gr. iii.—v. ter die. It is liable in over-doses to cause sickness, emaciation, and salivation; the first ill symptom is mostly vertigo.

Sarsaparilla and guaiacum, as combined in the *compound decoction of sarsaparilla*, appear to maintain the secretions, especially those of the skin and kidneys, to increase nutrition, and allay morbid irritibality of the nervous and circulating systems. Hence they are admirable remedies for debility during or after

a mercurial course; and for the multifarious variety of symptoms that arise when the health is broken down as well by the disease as by its remedy.

The *gangrenous ulcer*, (*sub-var. a. occurring in healthy subjects, with firm pulse, &c.*) requires to be treated by the early and free abstraction of blood; and then the bowels having been opened, and the pulse being reduced, opium should be given pretty freely in combination with salines and antimonials. The poppy fomentation is the best application at first, and the balsam of Peru, or nitric acid lotion subsequently, to assist in throwing off the sloughs. The ulcer which remains is usually healthy, and is very seldom followed by secondary symptoms; therefore *there is no need of mercury unless the sore begin to ulcerate*, (there being nothing in the general health to account for it,) or unless *secondary symptoms* appear.

The *phagedænic and phagedæno-gangrenous ulcers* must be treated according to the state of the system. If there be fever and thirst, with a full habit and hard pulse, blood should be drawn at first; if, however, there be debility, with quick and feeble pulse, opium should be given freely;—and if the application of a strong solution of opium do not stop the phagedæna, the diseased surface must be destroyed by strong nitric acid.*

If *phymosis* is present, and there is a discharge from under the prepuce, and it cannot be turned back, the existence of an ulcer will be detected by local hardness and tenderness. Whilst there is any inflammation, leeches and poultices must be applied, and milk and water, or a mild saturnine lotion, should be injected frequently between the prepuce and glans. If phymosis be caused by *small ulcers at the edge of the prepuce*, (which sometimes occur during the healing of venereal sores,) they should be touched with *arg. nit.*, or *cupri sulph.*, or *ung. hydr. nitrat.* The prepuce should never be slit up, unless there be so great tumefaction as to threaten sloughing.

As soon as the *frænum has been perforated* by an ulcer, it should be completely divided.

SECT. VI.—OF BUBO.

Definition.—Inflammation of a gland in the line of the lymphatics leading from a venereal ulcer.

Causes.—Bubo is said to be produced because the gland is irritated by the transmission of poison absorbed from the sore. But this is not proved. It is more probably caused by *continuous irritation.*

Varieties.—(1.) *Bubo of the Penis* consists of an inflamed

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* *Vide* page 77.

lymphatic vessel *en route* from an ulcer; it may suppurate, although it rarely does. Sometimes it is a mere abscess of the penis. It simply requires rest, leeches, poultices, purgatives, &c. (2.) *Acute bubo* is simple acute inflammation, and generally attacks one gland only. It pursues the course of an ordinary acute abscess. The cellular tissue between the gland and skin is the seat of suppuration. (3.) *Indolent or chronic bubo* very commonly affects more than one gland. It occurs in weak, scrofulous habits, and especially in persons worn out by the improper administration of mercury. The glands slowly enlarge; suppuration is slow and imperfect, and commences at several points. The skin is long before it inflames, but when it does so, a large tract of it becomes of a dusky bluish tint; the matter spreads widely;—and at last large portions of skin perish by ulceration or sloughing, leaving an extensive sore that may be months in healing.

DIAGNOSIS.—The common *query* is, whether a bubo be *venereal* or not. And it is commonly said, that a bubo *is venereal*, (i. e. arises from absorption of venereal virus,) if one gland only be affected, and that gland be at or above the level of Poupart's ligament;—but that if a *plurality of glands* be affected, the case is most probably one of *continuous irritation* merely; (or *sympathetic bubo;*) and that if the enlarged gland be seated *below Poupart's ligament*, it is most likely caused by some irritation about the foot or skin of the thigh or nates. But the term *venereal bubo* is one that conveys an erroneous idea, and leads to much mischief in practice. From whatever cause arising, bubo is the same. It is an inflamed gland, and must be treated as such, (due regard being had to the state of the system.) All authors agree that there is nothing specific in the matter which it forms;—therefore, bubo, *per se*, requires no specific treatment. If there be a venereal sore on the genitals, if the bubo be in the upper tier of glands, and if it cannot be accounted for by any other cause, we may say that it is produced by the venereal sore; but yet it must not be treated otherwise than a bubo from any other cause. It is because the system has been ruined by mercury that *venereal* buboes (as they are called) are more pernicious than others. Sometimes a bubo arises without any sore on the genitals, and without any other assignable cause;—and some instances of this description have been accounted for by supposing that venereal poison was absorbed from the skin without causing ulceration. But if such a thing were possible, (which is doubtful,) still mercury must not be given unless secondary symptoms appear.

TREATMENT.—1. The *acute* bubo must be treated as an acute abscess. The first indication is to procure resolution;—by rest;—purging with calomel and black draught;—salines, low diet, leeches, hot or cold applications, (according to the patient's choice,) and bleeding, if he be strong, full-bodied, and not reduced by mercury or otherwise. The applications to the sore should be

soothing, and mercury, if being administered, should be at once given up. Sometimes, it is true, a rapid exhibition of it causes a rapid disappearance of the bubo;—but more generally it hastens suppuration, and it certainly predisposes to subsequent spreading ulceration. It may easily be resumed afterwards. Even if matter does form, the surgeon should be in no haste to evacuate it;—but should endeavour to procure its absorption by repeated small leechings, cold discutient lotions, small *alterative* doses of mercury at bedtime, with aperients, attention to the health, and change of air. When the case becomes chronic, frictions, &c., may be used to remove any swelling that remains.

But if the matter increases, and the skin is inflamed and shining, a puncture should be made, and the case be treated as an acute abscess under the same circumstances.

2. In treating the *indolent bubo*, the general health must be amended by every possible means; tonics, the acids, sarsaparilla; change of air, and especially a sea voyage;—with occasional leechings and cold lotions, when demanded by an aggravation of heat and pain. If these measures fail, and matter forms, and the skin is becoming bluish and thin, a blister may be applied;—or the diseased skin may be rubbed with *arg. nit.*; which measures will either promote absorption, or at least stimulate the parts to a healthier action. But if the matter continue to increase, the swelling should be opened either by rubbing it with *potassa fusa*;—or by applying the nitrate first, and then opening it with a lancet;—either plan having the advantage of causing diminution of the swelled glands, and preventing the spread of ulceration. Mercury should not be given;—except, perhaps, in alterative doses towards the close of the case.

Sinuses, if they are not soon healed by stimulant injections, must be slit up. If the ulcer left by the opening of the bubo become *inflamed*, or *irritable*, spreading by ulceration, or if it be attacked by *sloughing*, or *phagedæna*, (which may destroy the patient by exhaustion, or by laying open the femoral artery,) the same treatment must be adopted that has already been directed for similar ulcers.

SECT. VII.—OF VENEREAL ERUPTIONS.

GENERAL DESCRIPTION.—Venereal eruptions are a complicated study. For they may assume the form of almost any cutaneous disease;—and eruptions precisely similar may be caused by the abuse of mercury. They generally occur about six weeks after the primary symptoms;—sometimes a fortnight, sometimes not for months. For some time before their appearance, the patient is generally thin and wan;—looks dispirited;—his eyes are heavy;—and he complains of want of appetite and sleep, and of rheumatic pains. They are generally ushered in with a smart attack of fever;

—are attended with more or less soreness of the throat;—and are generally more or less *copper-coloured.*

VARIETIES.—1. *Papular Eruption* consists of copper-coloured blotches, slightly elevated, preceded by fever, and arising successively over the body, but especially on the head. They may consist merely of vascular injection;—or numerous *papulæ*, mixed with small vesicles and pustules, may appear on them;—followed by small scabs and exfoliations of the cuticle.

2. *Scaly Eruption (Lepra syphilitica)* is by some said to be merely an aggravated variety of the papular. It begins with an eruption of copper-coloured blotches, which become covered with scales of enlarged cuticle;—these are succeeded by scabs, and when they fall off, by shallow ulcers with copper-coloured edges. When the blotches form where two cutaneous surfaces are in contact, they throw out fungous elevations.

3. *Vesicular Eruption, (Rupia.)* Large flattened bullæ, filled with serum, which gradually become purulent, and finally dry into scabs, under which the skin is ulcerated. The ulcers spread under the scabs, and the latter become remarkably thick from successive additions.

4. *Pustular Eruption. (Ecthyma.)* Large prominent pustules, with a copper-coloured base, leading to ulcers.

5. *Tubercular Eruption.* Broad, red, inflammatory tubercles, forming most frequently at the alæ of the nose, or on the cheeks. They gradually pustulate, and are succeeded by deep irregular ulcers, terminating in puckered cicatrices.

TREATMENT.—During the febrile stage, while there are thirst, pain in the head and chest, and quick pulse, bleeding, (if the patient can bear it,) rest in bed;—laxatives and antimonials should be employed, and followed by sarsaparilla. Subsequently, when the fever has vanished, if the patient has never been put under a mercurial course, and nothing forbids, he may be subjected to one, in the manner prescribed for primary symptoms. If he has, however, previously taken a full course of mercury, or if he be much reduced, and the sores irritable, sarsaparilla, nitric acid, tonics, change of air; an *alterative* course of Plummer's pill, or F. 7 at bedtime;—or small doses of *corrosive sublimate* (gr. $\frac{1}{16}$ ter die) alternated with iodide of potassium. If under the use of mercury the patient feels stronger and better, and the local symptoms amend, it may be given safely;—but if he get thinner, weaker, and haggard, and suffer from chills and slight fever;—or if the sores become irritable, or phagedænic, it should be given up. *Hyoscyamus* or *conium* added to the mercury often enable the system to bear it better, and remove its ill effects after it is discontinued.

Local Treatment.—If the ulcers are protected by scabs, nothing is required. If not, *ung. hydr. nitric oxyd.*, *ung. hydr. nitrat.*; black or weak yellow wash, or other mercurial sitimulants. If the sores be very irritable, narcotic fomentations must be tried, or opium

be mingled with the mercurial applications. *Sulphureous* and *vapour baths* should be used in the convalescent stage to remove a scaly or blotchy state of the skin.

SECTION VIII.—OF VENEREAL ULCERS OF THE THROAT AND NOSE.

VARIETIES OF SORE THROAT.—The *excavated* ulcer looks as if a piece had been scooped out of the tonsil. Its surface is foul and yellow, its edges raised, and ragged, and swelled. There is remarkably little inconvenience from it, and very little constitutional affection, unless it be attended with eruption likewise.

2. The *superficial* ulcer; the tonsils swollen, and displaying patches of excoriation covered with flakes of lymph.

3. The *sloughing* ulcer begins as a small *aphthous* spot, which rapidly ulcerates, and is attended with great pain and fever.

Venereal ulceration of the larynx is mostly caused by an extension of ulceration from the nose. It is characterised by tenderness, great huskiness of voice, (which frequently degenerates into a mere whisper,) suffocative cough, and expectoration of bloody purulent matter;—there is great loss of flesh and strength, and life is often terminated by suffocation.

Ulceration of the palate may either spread from the throat, or may commence in the periosteum. In either case, a portion of bone may exfoliate, forming an aperture between the nose and mouth.

Venereal disease of the nose begins with a small ulcer on the mucous membrane, covered at first with a scab, and attended with heat, dryness, and snuffling. The discharge is profuse and fetid; —ulceration spreading to the bones, they exfoliate and come away; the nose is either flattened, or the whole of it may perish.

TREATMENT.—If the patient has never taken a proper mercurial course, and if there be nothing to contraindicate it, he may be gently salivated. If he have taken a full course,—or if his health be altogether bad, he must be treated with sarsaparilla, iodide of potassium, hyoscyamus, the acids, &c., with alterative doses of mercurials, (especially the oxymuriate;) carefully watching that they do not disagree.

Local pain or inflammation must be combated by leeches, and blisters (to the throat.) Mercurial gargles and fumigations, the *oxymel æruginis*, and other stimulating lotions, are the applications for ulcers in the fauces, (provided there be no active inflammation.) Injections of nitric acid lotion will hasten exfoliations from the nose, and diminish the fœtor. Loose pieces of bone should be removed as soon as possible.

VENEREAL DISEASE OF BONE most frequently attacks the tibia, ulna, os frontis, and other superficial bones. It commences with

tenderness of the affected bone, and severe pain, which begins in the evening, and lasts almost all night, but ceases in the daytime. The pain is shortly accompanied with oblong swellings, called *nodes*, arising from infiltration of the periosteum with lymph and serum. Next, a quantity of serum is effused between the periosteum and bone, producing a fluctuating tumor. If the disease advance, the bone (which from the first is swelled) becomes carious; matter forms under the periosteum; the abscess bursts; exfoliations ensue; the patient suffers severely from the pain and discharge; and if the disease be seated on the head, (*corona veneris*,) he may die from extension of the suppuration to thedura mater.

TREATMENT. As far as the constitutional treatment and exhibition of mercury are concerned, the surgeon must be guided by the rules laid down when treating of the other secondary symptoms. Leeches and fomentations may be applied in the early stages; blisters and mercurial or stimulating plasters subsequently; —and the swellings should not be opened unless there be very great and obstinate pain, and the skin reddens.*

Change of air, good diet, warm bathing, tonics and alteratives, especially F. 1, 3, 7, 29, 30, 31, are useful remedies for the obstinate rheumatic pains and other symptoms of debility and cachexia which often follow the venereal disease and its treatment.

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* Vide Part v. chap. v.

PART IV.

OF SPECIFIC CACHEXIES.

CHAPTER I.

OF SCROFULA.

SYN.—*Struma.*

DEFINITION.—Scrofula is a state of constitutional debility, with a tendency to indolent inflammatory diseases.

GENERAL DESCRIPTION.—There are two varieties of scrofulous habits, which, although they agree in the main essential of constitutional debility, are yet totally opposite in many respects. In the *first*, (or *sanguine variety*,) the skin is remarkably fair and thin, showing the blue veins through it, and presenting the most brilliant contrasts of red and white;—the eyes are light blue;—the hair light or reddish, the forehead ample, and the intellect lively and precocious. Sometimes, however, as Mayo observes, the skin is *dark* and transparent, and the eyes dark, although there is the same general characteristic of delicacy and vivacity.* In the *second* or (*phlegmatic*) *variety*, the whole aspect is dull and unpromising;—the skin thick and muddy, the hair dark and coarse;—the eyes greenish or hazel, with dilated pupils—the belly tumid—the disposition dull, heavy, and listless; but yet in general patient, and capable of unremitting exertion.† In both varieties the natural functions are liable to be performed irregularly. Digestion is

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* Philosophy of Living, 2nd edit. 1838, p. 24.

† Of seventy-two scrofulous children, Mr. Carmichael found that forty-four had blue eyes, and twenty-eight hazel or black eyes. Of the forty-four with blue eyes, twenty-one had fair delicate skins

weak, the tongue often furred, and red on its tip and edges ;—the upper lip swelled ;—the appetite sometimes deficient, sometimes excessive, and attended with a craving for indigestible substances ; —the bowels torpid ;—the growth often stunted, and the chest narrow ;—the blood thin and watery ;—the muscles pale and flabby ;—and the heart and arteries, as well as the intestines, thin and weak. Finally, at puberty, the vital powers in the female are often sufficient to develope the generative system, and *chlorosis* is the result ;—whilst, in the sanguine variety, the manifestation of sexual passion, as well as of the other faculties, is unduly precocious, and occurs before the bodily developement permits it to be indulged in with impunity.

Inflammation in the scrofulous is peculiarly modified in its effects and processes. It is extremely obstinate, but seldom violent ;—slow and insidious in its origin, and not to be suddenly terminated by active measures. The lymph poured out in the *adhesive inflammation* is frail, and slow in becoming vascular. Scrofulous *pus* is serous and flaky ;—and *scrofulous ulcers* are essentially weak,—their surface pink, their granulations flabby,—and edges undermined.

Tubercle.—The most characteristic manifestation of scrofula is the formation of *tubercle* ;—an opake, pale yellow, or yellowish gray substance, generally found in round nodular masses, whence it derives its name. It appears to be composed of unhealthy fibrine. It is generally supposed to be destitute of life, and incapable of organisation. It is most frequently secreted by mucous membranes, and especially into the air vesicles of the lungs, where it gives rise to pulmonary consumption ;—or into the follicles of the intestines ;—or into the lymphatic vessels and glands ;—or it may be deposited into the secerning vessels of the mamma, testis, liver, or kidney ;—or into the cellular tissue ;—or into the substance of bones ;—or it may be secreted by serous membranes. But in whatever situation it may be, its course is the same. In the *first stage* it is deposited slowly and insidiously ;—causing no pain or other symptom, unless it mechanically interfere with some function. In this quiescent state it may remain for an indefinite period, till at length the *second stage* arrives. The surrounding tissues inflame, and form an abscess, which contains the tubercle, softened and broken down by the effusion of serum and pus. In the *third stage* the abscess bursts, allows the tubercle to escape, and then in favourable cases may contract and heal.* Sometimes

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and light hair ;—and twenty-three sallow or brown skins and dark hair. An Essay on Scrofula, by Richard Carmichael, Lond. 1810.

* Latham, op. cit., lect. xii. Carswell, op. cit. *Fasciculus* Tubercle.

a natural cure is performed by an absorption of the tubercle;—its earthy particles, however, (consisting of the phosphate and carbonate of lime,) being left behind;—and these earthy matters may remain quiet for life, or may after a time excite suppuration; such cases being called *stony cancer* by the vulgar.*

CAUSES.—The causes of scrofula comprise all the circumstances capable, directly or indirectly, of lowering the vital energies. Poverty and wretchedness;—meagre, watery, and insufficient food, without a due share of meat;—neglect of exercise;—confinement in close, foul apartments;—insufficient clothing;—and habitual exposure to damp and cold, might bring it into existence in the healthiest. It is exceedingly common in the insular and variable climate of England, and still more so in Scotland;—and it is well known that monkeys and parrots, as well as human beings, brought to this country from the tropics, not unfrequently die of consumption or other scrofulous disease. Scrofula may be said to be strictly *hereditary*;—that is to say, if the parents be scrofulous, the children will inherit the same bodily organisation, and the same predisposition to disease. This *predisposition* may be so strong in children, that the disease breaks out in spite of all care, and even although they may be guarded from every circumstance capable of lowering the health;—or perhaps it may not be sufficient unless aided by some of the *exciting causes* above enumerated;—or unless the health is depressed by some other disease first;—as for instance, by scarlatina, measles, small-pox, or other acute illness, especially if treated too liberally with mercury. Everything that disorders the digestive organs may bring scrofula into action. Hence it may be excited in the rich by over-feeding and gluttony, by gross oily food, with too many sauces and wines, as well as in the poor by their more flatulent diet of potatoes or oatmeal. It rarely appears before two or after thirty years of age;—although every disease that occurs is more or less marked with its peculiar characters; and it may be called into active operation at any age by exposure to the exciting causes.

TREATMENT.—The indications are, to strengthen the system generally, and to prevent local disease by rendering the blood pure and the circulation vigorous, and by keeping up the secretions. The means are both *regimenial* and *medicinal*. The former include diet, clothing, air, exercise, and bathing.

(1) The *diet* of the scrofulous should be nutritious and digestible;—savoury enough to entice a weakly appetite, but not to

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* We must observe, that many of the above-mentioned points respecting the pathology of tubercle, although in accordance with the views of the last-cited authorities, are rendered doubtful by the recent investigations of Mr. Grant Calder. Vide the Med. Gaz. for May, 1838.

invite excess. It should consist of meat, bread, and farinaceous substances generally;—with a sufficient quantity of beer or wine to promote digestion, without creating drowsiness or feverishness. (2) The *clothing* should be warm, especially for the neck, chest, and feet;—so as to keep up the cutaneous circulation, and prevent congestion in the chest or abdomen. Flannel should be worn nearest the skin both in winter and summer;—in the former, for direct warmth, in the latter, to neutralise any accidental changes of temperature. (3) Free *exercise* in the open air in fine weather, and in airy apartments when it is damp and cold, is indispensable. The accelerated venous circulation which it causes, and the compression of the abdominal viscera by the contraction of its muscles, are, as Mr. Carmichael has justly shown, the best means of promoting the action of the liver, and of preventing costiveness with its attendant evils. But exercise should be *voluntary*,—because then it will not be likely to be carried to the pitch of *fatigue*, than which nothing can be more injurious. *Gymnastic exercises* should be used with the utmost caution. (4) The best *residence* for the scrofulous is one that is warm, without being damp in the winter, and cool and bracing in the summer. The high lands of the interior, Malvern, for instance, or Clifton, in the summer;—" in the late autumn, when the air loses its freshness and is tainted with the falling leaf and decaying vegetation, the sea side;"—in the winter and spring, the mild climate of the Isle of Wight or coast of Devon, or a town residence, are alternations that might be advisable for those that can afford them. But if the habit be extremely delicate, and disposed to phthisis, nothing can be better than a removal to Madeira;—provided that it be adopted in time;—and that the sufferer be not expatriated (as is too often the case) merely to die. (5) Daily *washing and friction* of the skin are as beneficial to the scrofulous as they are to every one else; and if the patient be precluded from taking exercise, friction is indispensable. Cold *sea-bathing* is in general so advantageous, that it has been deemed a specific. An aperient dose should be given before commencing it, if the habit be gross; and it is a good plan to use a tepid bath or two (90°—80°) first. The object in using the cold bath is to produce a *vigorous reaction*;—consequently, before taking it, the nervous and circulating systems should be in some degree of excitement; and the skin should be warm, although not perspiring. If the bather be strong, he may plunge into the open sea early in the morning, on an empty stomach, not only with impunity, but with advantage; but the forenoon is the best time for a weakly person, when the air has become warm, and the system is invigorated with a breakfast. If after bathing the surface is cold, numb, and pinched, (immersion not having been protracted,) it is injurious. In many cases, especially of scrofulous ulcers, *river bathing* will be found more efficacious.

The *medicinal remedies* for scrofula consist chiefly of *aperients*,

tonics, and *alteratives*. A dose or two of calomel and jalap may be given at first to clear the bowels thoroughly, and then a grain or two of *hydrarg. c. cretâ* with rhubarb, at bedtime once or twice a week, so as to cause daily evacuations, properly tinged with bile. If the habit be gross, and there be any active inflammation, purgatives should be freely repeated. The best *tonics* are bark and steel;—the former being better adapted to make a sudden impression in cases of urgent debility, and the latter for continued administration. Either will cause headache, if the liver be inactive. Combinations of *rhei* gr. ii, *cum ferri carbon.* gr. v;—or of *sodæ carb. exsic.* gr. v, *calumbæ* gr. x, *rhei* gr. ii;—or of *hydrarg. bichlor.* gr. i, *tinct. rhei*, *vel cinchonæ* f℥ii, (dose, a teaspoonful,) three times a day, are recommended by Sir A. Cooper. The *tinct. ferri sesquichloridi*, *vel ammonia chloridi*;—or combinations of iron with quinine;—or of iron with aloes and ammonia, (F. 28;) in fact most combinations of tonics, aperients, and alkalis are useful;—the alkali being given just in sufficient quantity to neutralise any acid in the primæ viæ, but no more.

Besides these, sundry other drugs have gained repute for their efficacy in scrofula, especially *conium*, (an excellent internal and external remedy when there are painful spreading ulcers;)—*aconite*, (of similar virtues, but more powerful);—the *muriates of lime*, *and baryta*;—*alkalis*, *burnt sponge*, and *iodine*. A *soi-disant* specific is hatched about four times in a century. Iodine is the latest, and consequently the favourite at present. It certainly excites absorption;—and people having conceived that scrofula in some way depends on debility of the absorbents, think that iodine must be its remedy. No reasonable person, however, will subject a patient to the influence of a powerful medicine, merely because he has heard it called a specific;—and no one can expect that a malady, depending frequently on some original vice of organisation, and affecting every solid and fluid in the frame, is to be removed all at once by any remedy that happens to be in fashion. Iodine frequently acts as an excellent tonic, causing a most rapid and remarkable increase of flesh and strength. If so, it may be administered with benefit; but in other cases it impairs the appetite, and produces feverishness and emaciation. Its dose should be small, and it should be combined with a metal or an alkali, or with the iodide of potassium, to render it soluble, and then it will not be so likely to irritate the stomach. Five minims of the *tinct. iodinii composita*, (which may be combined with five or ten minims of *tinct. ferri mur.*); or gr. ¼ of the *iodide of iron bis die*, are proper forms and doses.

SCROFULOUS DISEASE OF THE CERVICAL GLANDS is very common in children, and depends on a deposit of tubercle into them, or into their vessels immediately adjoining. One or more glands enlarge, and form tumours that are perfectly indolent unless acci-

dentally inflamed. They may remain stationary, or may slowly enlarge for months or years, and then, from some local irritation, or from some impairment of the health, they inflame, and form abscesses, containing unhealthy pus mixed with tubercle. The skin next reddens, and becomes purple and very thin;—an aperture forms, the pus escapes;—the inflamed skin ulcerates, forming a large sore, which heals, after many months, with an ugly puckered cicatrix. These swellings have been known to destroy life by compressing the trachea, or cervical vessels, or by bursting into them.

TREATMENT.—The health must be amended by the measures just detailed;—and an endeavour must be made to cause absorption, by the application of hot salt water, or of the zinc lotion, or of cold poultices made with sea-weed;—by an occasional leech when irritated;—and by ointments of iodine when indolent. It may sometimes be expedient to extirpate one or more glands. By these means, even if they do not disappear, they may remain quiet for years. But if suppuration occurs, and *if the skin begins to redden*, they should be opened in the manner, and with the precautions, laid down in the section on *chronic abscess* (p. 60.)

TABES MESENTERICA, or MARASMUS, consists in a tubercular disease of the mesenteric glands and of the follicles of the intestines, precisely similar in its course and phenomena to the same disease in the cervical glands. The numerous abscesses that form in the mesentery burst into the intestines, or into the abdominal cavity; and on a *p. m.* examination the peritonæum is found as thick as leather, and the intestines resembling a collection of cells rather than a simple tube.

Symptoms.—Emaciation and voracity, owing to the obstructed course of the chyle;—the belly swelled and hard;—the skin dry and harsh;—the eyes red;—the tongue strawberry-coloured;—the breath foul;—the stools clay-coloured and offensive, sometimes costive, sometimes extremely relaxed. The patient of course dies hectic, although he often lasts wonderfully long.

TREATMENT.—Animal food and other nutriment given in small quantities at short intervals;—mild mercurials to amend the intestinal secretions, especially the combination of hydr. bichlorid. with tinct. cinchonæ;—tepid bathing;—stimulating liniments to the abdomen;—change of air;—and the cautious administration of the tonics mentioned above.

CHRONIC ABSCESSES in the subcutaneous cellular tissue are perhaps the most frequent of scrofulous maladies;—and when they burst, they lead to obstinate ulcers, which in severe cases may spread rapidly, destroying the skin and the interstitial cellular tissue, sometimes causing the patient to die exhausted;—or perhaps leaving a limb useless if he recover. The abscess must be treated as has been before directed;—and the ulcer by alternations

of mild stimulants, such as ointments, or lotions of conium, nitrate of silver, iodine, (F. 27,) black wash, calamine, chalk, oxyde and sulphate of zinc, and red precipitate of mercury.

CHAPTER II.

OF MALIGNANT DISEASES.

SECTION I.—INTRODUCTORY.

DEFINITION.—Malignant diseases consist in the deposit and ulterior changes of a substance altogether alien to healthy structure. They possess the following characteristics. (1) They terminate in the gradual destruction or transformation of the tissues which they affect. (2) They progressively invade and destroy the tissues in their vicinity. (3) They travel in the course of the lymphatics, and attack the nearest glands. (4) They affect several organs in the same individual, if time be allowed.* (5) If mechanically removed from any part, they mostly reappear in or near the cicatrix.†

VARIETIES.—There is a well-marked difference in these formations as they occur in different individuals, or at different stages of their growth. Some of them, as *scirrhus*, possess little or no tendency to be organised, but occur as firm, pale masses, destitute of blood-vessels, and dependent on the adjoining tissues for their increase and nutrition. Others, as *medullary sarcoma*, possess an inherent tendency to become organised and vascular, and increase in bulk by their own organic powers. They consequently are much greater in bulk, and more rapid in increase, than the last. But the first variety (scirrhus namely) may assume vascularity and organisation, and so pass by an easy transition into the state of fungus medullaris.‡

FORMATION.—These morbid growths may be formed *by secretion*, —that is, may be deposited into the interstices, or upon the surface of tissues;—or they may be formed in the way of *nutrition* or *transformation*;—that is, may be deposited as part of the molecu-

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* It will be manifest from this definition, that some ulcerations (lupus, &c.,) although *destructive and incurable*, are not to be styled *malignant*;—because they are purely *local*. C. Hawkins on Malignant Diseases of the Face, Med. Chir. Trans., vol. xxi.

† Carswell, op. cit.

‡ Many specimens of this transition are shown in Carswell's Elements.

lar texture of organs;—the normal structure being gradually replaced by one composed of the diseased growth.

SECTION II.—OF SCIRRHUS.

SYMPTOMS.—Scirrhus begins usually as a rounded and peculiarly hard tumour, subject to occasional fits of severe lancinating pain.

ANATOMICAL CHARACTERS.—When examined, it is found to be hard, heavy, and nearly of the consistence of cartilage. It cuts with crispness like a potato or unripe pear. On a section, it appears to be composed of numerous dense white bands, intersecting each other irregularly, appearing to radiate from the centre, and having their interstices filled with a yellowish or reddish granular substance.

SEAT.—Scirrhus may occur in any organ or any texture; but by far the most frequently in the glands, especially the female breast, and the lymphatic glands in its vicinity.

PROGRESS AND TERMINATION.—The progress of this disease is twofold. On the one hand, it spreads and successively invades all the adjoining tissues;—and at the same time the older portions of the morbid growth perish by ulceration or sloughing. At first the tumour is indolent and painless, so that the patient may be for a long time ignorant of its existence; it is also circumscribed and freely movable. After a time it is affected with fits of severe lancinating pain, which gradually increase in frequency and severity. Then it slowly enlarges;—loses its distinctness, becomes blended with the adjacent parts, and adheres to the skin and to the parts beneath it. Then the *destructive stage* commences. Portions of the tumour soften down, and form irregular abscesses; the skin ulcerates or sloughs,—and thus an open sore or *cancer* is formed. This ulcer enlarges in every direction; its edges are thick and jagged;—sometimes undermined and inverted, sometimes swelled and everted. The surface is tawny or ash-coloured, and eaten into irregular hollows. The discharge is thin, sanious, fetid, and irritating,—and there is an almost constant burning pain. Sometimes a feeble attempt is made towards reparation;—pale, flabby granulations are thrown out, and a portion of the sore cicatrises for a time. In some few cases, the whole of the diseased growth has sloughed out, and then a permanent cure has followed.* But in general the ulceration spreads, the neighbouring glands or viscera are contaminated, and the patient sinks from the constant pain and irritation.

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* Travers on Malignant Diseases, Med. Chir. Trans., vol. xv. p. 213.

CONSTITUTIONAL SYMPTOMS.—From the first there is a state of ill health which cannot be solely attributed to the local disease, and which is denominated the *cancerous cachexia.* The patient is languid, depressed, and emaciated;—the complexion is leaden and sallow, the appetite bad, and digestion imperfect. As the disease advances, hectic is induced by the pain and exhaustion,—the vital energies are further lowered by the absorption of deleterious secretions; and the patient suffers from the co-existence of the disease in other organs. An extraordinary *fragility of the bones*, so that the femur might be broken by turning in bed, is by no means an uncommon phenomenon;—partly arising from atrophy, partly from scirrhous disease.*

DIAGNOSIS.—The diagnosis of scirrhus from other chronic tumours is at times most uncertain. Its principal characteristics are, *hardness*, *lancinating pain*, the co-existence of the *cancerous cachexia*, the patient's *age*, and the *situation* of the tumor. But as none of these characteristics may be well marked; and as tumors which have been harmless for years may ultimately assume a malignant aspect, the diagnosis must often be *guarded*;—that is, hedged in with intimations of its fallibility.

PROGNOSIS.—Although the destiny of a scirrhous tumor and of the patient be pretty certain, still the time in which the disease may prove destructive is most uncertain. So that if the patient be old;—if the disease has lasted long, and has been slow in its progress;—if the health is tolerable, and the cachexia not well marked;—much comfort may be derived from the assurance, that although the disease is incurable, yet life may be prolonged for many years, and may perhaps at last be terminated by some other malady.

CAUSES.—The genuine cause of cancer is some unknown bodily conformation. which may be congenital and inherited, or may be engendered by some causes equally unknown. Grief and the depressing passions, and whatever tends to impair digestion and nutrition, are the best-established *predisposing causes.* Females are more liable to it than males;—and persons above forty than those under it;—and persons of spare, bilious temperament and dark complexion, than those who are light, fat, and ruddy. But it has occurred in girls under twenty. Some authors think it most liable to attack the unmarried or barren; others state the direct reverse. Blows or other injuries may act as *exciting causes*, and produce it in a particular part;—but they are insufficient unless the constitutional tendency exists.

TREATMENT.—If no circumstance forbid, a scirrhus should be extirpated with the knife, care being taken to remove every particle that appears unsound. Extirpation, however, will not effect

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* Salter in Med. Chir. Trans., vol. xv.

a cure. In ninety-nine cases out of a hundred the disease returns. But (to use the words of an accomplished author*) "the period of the return of scirrhus varies from six months to two or three years, or even longer. The interval may be one of health and hope; and even when the disease reappears, it does not in general return in a character of such formidable suffering as in its ordinary course it presents." The operation may be performed with some confidence if the disease be recent, movable, circumscribed, and indolent. If, however, the skin is extensively tuberculated and adherent to the scirrhus;—if the surrounding fat and cellular tissue be implicated;—if the diseased part be firmly adherent;—if it is extensively ulcerated;—or if the original disease is much less in degree than co-existent scirrhus of the adjoining lymphatic glands;—or if the patient's health is fast sinking;—or if there be any palpable internal disease, the operation should not be attempted. Yet, although there be *extensive ulceration*, it may be justifiable occasionally, in order to afford even a month's respite from agonising pain. Before operating, the health should always be regulated by a course of alteratives and tonics.

Sundry *caustics* have been proposed, in order to cause sloughing of the diseased growth. But they are on the whole more painful and dangerous than the knife, and infinitely less effectual. *Arsenic*, applied as a paste, has been more used than any other; but useful as it is in many obstinate ulcers, it is no remedy for scirrhus. The *chloride of zinc*, a remedy recently imported and vulgarised, is recommended by Cæsar Hawkins in flat cancerous formations of the skin.

The general *indications* in the treatment of scirrhus and cancer are, to amend the general health;—to restore the secretions;—to diminish irritability;—to support the strength;—to counteract any accidental inflammation;—and to allay pain.

If the patient be young and plethoric;—and the fits of pain be frequent, and accompanied with heat and throbbing;—the diet should be reduced, the bowels be freely opened, and leeches be applied. As a general rule, Sir A. Cooper recommends the administration of five grains of Plummer's Pill at bedtime, and a draught containing *ammon. sesquicarb.* gr. v., *sodæ sesquicarb.* 3ß; *tinct. calumbæ* 3j; *inf. gentianæ* ℥iß, twice in the day. But mercury, although highly useful as an *alterative*, must never be given so as to affect the system, or the ravages of the disease will be hastened.

The preparations of *iron* have been highly extolled, especially the carbonate and the ammonio-chloride. Either may be given with benefit when the lips are pale, the pulse weak, and the patient low and emaciated. The *ammonio-chloride* in pills, in doses

* Mayo, Pathol., p. 573.

of gr. ii. ter die, was a favourite medicine of the late Mr. Cline, and often effected the dispersion of chronic indolent tumors not really scirrhous.

Narcotics of all descriptions are necessary to relieve the pain. They are most advantageously given in combination, and require to be frequently changed and varied.

Vegetable diet, or low diet approaching starvation, has been much recommended. But by weakening the system, and increasing the irritability of the heart and nervous system, it cannot fail to be mischievous.

In fine, the treatment may be thus briefly summed up. The health must be improved by alteratives and tonics, by change of air, freedom from anxiety, and a diet that will support the strength, without heating the system. Wine may be allowed in moderation, if the patient is weak and is accustomed to it; narcotics must be given according as they are demanded. The *local treatment*, during the scirrhous stage, consists in occasional leeching, and the application of any mild plaster, (E. saponis, E. plumbi, to which belladonna or opium may be added,) to preserve the part from mechanical injury, and from changes of temperature. Fine flax is often used for the same purpose. It is sometimes useful to make an issue in the vicinity.

In the ulcerated or *cancerous stage* the objects of local treatment are to allay pain, and to correct the fœtor and acrimony of the discharge. Whatever applications are chosen, they must be frequently changed and varied. Poultices made of the pulps of carrots;—or with the leaves of conium, hyoscyamus or belladonna;—poultices medicated with the extracts of those plants, or with opium, or the extract of poppies;—ointment or lotions containing the same narcotics, or the salts of morphia, may be tried in succession. Sometimes relief is afforded by alternation with mild stimulants; as weak lotions of the chlorides of lime and soda;—or of the nitric or nitro-muriatic acid;—or nitrate of silver. Affusion with very cold or iced water is sometimes of use. *Carbonic acid*, a powerful narcotic and allayer of irritability, may be often advantageously applied by means of fermenting poultices; or by generating the gas in a bottle, and directing the stream on the surface of the sore through a tube.

Although, in the present state of our knowledge, it is utterly impossible to procure the absorption of a scirrhous tumor, still, if there be any doubt as to its nature, it may be advisable to employ iodine, or the iodides of potassium, iron, or lead, externally and internally;—by which means some suspicious tumors have been dispersed.

SECTION III.—FUNGUS MEDULLARIS AND FUNGUS HÆMATODES.

SYN.—*Encephaloid disease*; *soft cancer*; *spongy inflammation*; *medullary sarcoma.*

SYMPTOMS.—Fungus medullaris presents itself as an insidious tumour, growing rapidly, generally unattended with pain, not hard, and usually blended with the surrounding tissues.

ANATOMICAL CHARACTERS.—This tumor on examination is found to be unequally soft and lobulated. On a section, it appears to be whitish, and of the consistence of brain or marrow; but in this respect it varies greatly. Some portions of it are often found broken down, and of the consistence of putrid brain or thick cream. It often contains cysts, which may be filled with clear serum, or with a fluid resembling coffee, and composed, according to Sir A. Cooper, of serum, blood, and bile. This formation is highly vascular, and its delicate blood-vessels occasionally giving way, its substance is infiltrated with blood, and resembles a coagulum;—in this state it is called *fungus hæmatodes*. It is by no means unusual to find scirrhus, fungus medullaris, and fungus hæmatodes, combined in the same tumor, being in fact different states of the same disease.

PROGRESS AND TERMINATION.—This tumor enlarges rapidly; and its arterial circulation is sometimes so vigorous as to cause pulsation like an aneurism. The skin covering it soon becomes purple or livid; and the subcutaneous veins enlarged and tortuous. It is now subject to fits of aching or throbbing pain, but by no means so severe as that of scirrhus. At length one of the most projecting points ulcerates, and discharges a grumous fluid,—and a rapidly increasing fungus shoots from the aperture. Sometimes this fungus exudes an enormous quantity of a thin, colourless serum;—sometimes it is covered with a slight crust of coagulum;—sometimes its blood-vessels give way, and there is a profuse hæmorrhage;—and sometimes large portions of it soften down or slough. The constitution suffers in the same manner as in scirrhus, but much more early and severely; and the patient expires after a few months, worn out by the irritation of the external malady, and by its invasion of the viscera.

DIAGNOSIS.—This disease is to be distinguished from scirrhus by the absence of hardness and lancinating pain;—by the greater rapidity of its growth;—by the earlier and more decided cachexia;—by its attacking persons of every age, and being more frequent in the young; whereas scirrhus is exceedingly rare under thirty;—and by its disposition to fungate rather than to ulcerate.

PROGNOSIS.—This of course will be highly unfavourable, the patient sinking much sooner than in scirrhus.

CAUSE.—Some unknown constitutional peculiarity.

TREATMENT.—The system should be amended in the same manner as directed in the last-described disease. Any local treatment except extirpation is altogether nugatory; and that should be performed as soon as possible, or it will scarcely retard the patient's destruction. The disease is sure to return; and if the operation be delayed till the skin has reddened, it very probably may return before the wound is healed. Hæmorrhage in this disease, or in cancer, is best restrained by pressure with a piece of lint.

SECTION IV.—OF THE MAMMARY AND PANCREATIC SARCOMA, GELATINIFORM CANCER, CIRRHOSIS, AND MELANOSIS.

The *mammary* and *pancreatic sarcoma* are tumors which were so designated by Mr. Abernethy, from their resemblance in structure to those glands. They appear to be varieties of scirrhus or medullary sarcoma; and to form as it were transition stages between them and the ordinary fleshy sarcoma: being not so certain as the former to lead to destructive changes, but more so than the latter.

Gelatiniform cancer (*tumeur colloid*) is a rare variety of scirrhus, in which a soft, gelatinous, semi-transparent substance is combined with more or less of the genuine scirrhous deposit.

Cirrhosis is, as its name implies, a fawn-coloured deposit, mostly found in the liver or kidneys. Sometimes masses of malignant deposit are met with, resembling medullary sarcoma, but of a remarkably *green* hue.

Melanosis is an ill-understood disease, much less frequent in the human subject than in the horse. It is doubtful whether it is really malignant, although, when found in man, it is mostly in conjunction with medullary sarcoma. It consists in the deposit of an unorganised brown or black substance principally composed of carbon. It is found chiefly on or near serous membranes; but may also occur in any other texture, either alone or combined with other morbid growths. It is deposited at first fluid;—then it becomes solid;—and lastly again liquefies; when it may or may not occasion suppuration of the parts surrounding.

PART V.

OF THE INJURIES AND SURGICAL DISEASES OF VARIOUS TISSUES, ORGANS, AND REGIONS.

CHAPTER I.

OF THE DISEASES OF THE CELLULAR TISSUE.

SECTION I.—CARBUNCLE.

DEFINITION.—An unhealthy inflammation and sloughing of the cellular tissue.

SYMPTOMS.—It begins with a hard, circumscribed, livid red swelling, and with burning pain. Its most prominent part soon becomes soft and *quaggy*, and numerous small ulcers form, which give exit to a thin discharge, resembling flour and water. These gradually unite, and form a considerable opening, from which a slough of cellular tissue is slowly protruded; and when that is separated, the parts may granulate and heal. The most usual situation for carbuncle is the back. It usually afflicts elderly persons of bloated frame and intemperate habits. There is always considerable irritative fever, and great disorder of the digestive organs. The patient will be in considerable danger if very old and weak;—if the fever assume a typhoid character;—or if the carbuncle be very large, and seated on or near the head.

TREATMENT.—A free incision must be made completely through the tumor; a second at right angles, if it be large; then stimulating poultices (of port wine and oatmeal, of yeast, beer grounds, &c.) and warm dressings, such as *basilicon* thinned with turpentine. By these means a free exit is afforded for the sloughs and discharge, and the living parts are excited to healthy suppuration. The *constitutional treatment* consists in evacuating and correcting the secretions of the alimentary canal, in abating fever, and supporting the

strength. The appropriate remedies are, a warm emetic, followed by a dose of calomel and camphor; and purgatives, (F. 4, 8, 9,) effervescing salines, if there be much heat and thirst;—otherwise bark, with the mineral acids and opiates, (F. 1, 3,) or with ammonia if the pulse be low;—together with wine, beef-tea, and arrowroot, if required.

Boils are miniature carbuncles. The best plan is to cut them through as soon as possible, poultice for a few hours, and then apply stimulating plasters;—empl. galbani vel ammoniaci, or cobbler's wax. The general health should be attended to in all cases, and the diet be regulated. If they continue to come out in successive crops, alteratives must be tried; such as, Plummer's pill; sarsaparilla; saline or sulphureous mineral waters, and sea-bathing;—but the liq. potassæ, or sodæ carb., in moderate doses three times a day, is generally considered of most utility.

SECTION II.—TUMORS.

I. The Common Vascular Sarcoma, or *simple fleshy tumor*, is a yellowish-white, firm, fleshy, or fibrous mass;—with few blood-vessels;—often surrounded with a cyst of condensed cellular tissue;—and sometimes containing irregular patches of bone or cartilage.

Its *formation* is supposed to be owing to the organisation of lymph. In *external character*, it is a firm, lobulated tumor, circumscribed, movable, and free from tenderness, unless accidentally inflamed. It is also free from pain, unless it press on some sensitive part. It grows slowly but steadily, and when it has attained considerable bulk, the veins on its surface become enlarged and tortuous. (1) It may last the whole life of the individual, without any ulterior consequences. Or (2) it may, by its enlargement, inflame the skin, and then slough out entirely. (3) It may produce sundry inconveniences, or even death, by pressure on various parts. Or (4) it may become the seat of malignant ulceration. It is known from abscess or inflammatory tumor by its *slow*, but *steady* and *painless* enlargement. From scirrhus it is known by the absence of lancinating pain, and of the cancerous cachexia. But as it may degenerate into cancer, the proper *treatment* is extirpation with the knife.

II. The Fatty Tumour consists of lobulated masses of fat, very slightly vascular, and contained in a cyst of cellular tissue. In *external character*, it is a softish, lobulated, painless tumor, feeling like fat. Its *growth* is slow, but progressive; and it may attain enormous bulk, even forty pounds. Its *terminations* may be the same as those of the last-mentioned tumor, and its *treatment* should be also the same.

Operation.—An incision—rather too long than too short—should be made along the tumor, and through its cellular cyst. If

the skin adhere to it, (but not otherwise,) a portion may be removed by two elliptical incisions. Next, the tumor should be removed as rapidly as possible, partly by cutting its cellular adhesions, partly by tearing them with the finger. Then the wound should be examined to ascertain that extirpation is complete;—and after bleeding has ceased it should be closed, and healed by the first intention. Sometimes fatty tumors may be removed by passing a seton through them, so that they may waste away in suppuration. This method is more tedious and painful than excision, but it may be adopted when it is an object to avoid a long cicatrix.

III. ENCYSTED TUMORS, or *Wens*, occur most frequently under the skin of the head. They consist of a sac, smooth on its internal surface, and containing various matters;—sometimes like curd or rice, (such tumors being formerly called atheroma;)—sometimes like suet, (steatoma;)—sometimes like honey, (meliceris;)—sometimes mere water;—sometimes hair, or matter like horn. These tumors are painless, rounded, elastic, circumscribed, movable, and they fluctuate indistinctly. They enlarge slowly and steadily.

Treatment.—If inconvenient, extirpation is the only remedy. *Setons*, *injections*, or any means for obliterating them by exciting inflammation, are very hazardous;—because these cysts (like all new textures, are liable, if irritated, to take on malignant action. *Iodine*, or other ointments for creating absorption, are perfectly useless, and may be mischievous. If the tumor consist, as it occasionally does, of an enlarged and obstructed follicle of the skin, its aperture (a little black spot) should be looked for, a probe may be passed into it, and the contents be squeezed out as often as necessary. Otherwise, a straight, double-edged, pointed bistoury should be thrust completely through the tumor, then the cut edge of the sac should be seized with forceps, and the whole of it be dissected out.

IV. THE PAINFUL SUBCUTANEOUS TUMOR is a small hard body, rarely larger than a pea, seated immediately under the skin, liable to fits of excruciating pain, and supposed to be formed in the substance of a nerve. It must be extirpated. The removal of such a tumor from the breast has cured an obstinate hysteria.*

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* Wood in Edinburgh M. C. T., vol. iii. Lond. Med. Gazette, vol. vi. p. 59.

CHAPTER II.

OF THE DISEASES OF THE SKIN.

SECTION I.—ERYSIPELAS.

DEFINITION.—A diffused inflammation of the skin.

VARIETIES.—1. *Simple* erysipelas affects the skin merely. 2. *Phlegmonous* erysipelas is complicated with inflammation of the subcutaneous cellular tissue. 3. Erysipelas of the *head* is often complicated with delirium in the early stages, and coma in the latter—owing to inflammatory excitement of the cerebral membranes, with tendency to serous effusion. 4. *Gastric* or *bilious* erysipelas is complicated with bilious vomiting, tender and puffed abdomen, red tongue, and perhaps diarrhœa. 5. *Erratic* erysipelas wanders progressively; some parts being attacked, whilst others are recovering. 6. *Metastatic* erysipelas ceases suddenly at one part of the skin, and flies to another. 7. *Recurrent* erysipelas suddenly leaves the skin, and some internal organ is attacked with inflammation.

SYMPTOMS.—*Simple* erysipelas is known by vivid scarlet (or sometimes yellowish) redness of the skin, which *disappears momentarily on pressure*;—considerable swelling, owing to serous effusion into the cellular tissue;—and severe stinging, burning, or smarting pain.

In the *phlegmonous* erysipelas, the redness is deeper, and in some cases dusky or purple, and it is *scarcely*, if at all, *dispelled by pressure*—the swelling is much greater, and is hard, brawny, and tense;—and the pain is not only burning but throbbing.

Both varieties are ushered in by shivering, headache, pain in the back, and nausea;—and both are attended with fever;—which in the young, robust, and plethoric, will be of an ardent inflammatory character;—but in the aged and debilitated, or after the occurrence of sloughing, may rapidly become low and typhoid.

TERMINATIONS.—*Simple* erysipelas may terminate (1) in *resolution*, leaving nothing but desquamation of the cuticle, and slight œdema; 2, but more frequently it produces large vesicles, from effusion of serum under the cuticle;—and these dry into scabs, which peel off, and leave the cutis either healed or superficially ulcerated.—3. Sometimes it is followed by small *abscesses*. *Phlegmonous* erysipelas *may* terminate as favourably;—but it more generally leads to unhealthy suppuration and sloughing of the cellular tissue;—the swelling becomes flaccid and *quaggy*;—patches of the skin become purple and covered with livid vesications, and these patches slough, giving exit to a thin sanious pus, and to flakes of disorganised cel-

lular tissue. And not only the subcutaneous, but the intermuscular tissue and fasciæ may slough, rendering the limb useless, even if the patient escape with his life.

PROGNOSIS.—This must be *guarded* if the patient be old, enfeebled, and habitually intemperate:—if the constitutional affection be low and typhoid;—if the malady be situated on the head or throat, and there be coma or great dyspnœa;—or if in the phlegmonous variety a large portion of the cellular tissue and skin is on the point of sloughing.

CAUSES.—The *constitutional* causes are intemperance, fatigue, or whatever else can irritate the digestive organs, and weaken the nervous system; or certain states of the air, (the disease being *epidemic*, and affecting several individuals simultaneously;—or *infectious* by means of the emanations from patients affected with it.) These causes may be sufficient of themselves to produce the disease (which then is said to be *idiopathic*;) or they may be *predisposing* merely, and require the addition of some *exciting cause*. Any injury of the skin may be an exciting cause of erysipelas;—especially leech-bites, caustic, and burns. *Idiopathic* erysipelas generally attacks the head.

TREATMENT.—The indications are, to diminish inflammatory action and febrile excitement,—to support the strength,—to correct the secretions,—and *locally*, to allay irritation,—to arrest the extension of the disease,—and to give free exit to sloughs and discharge.

In the first place an *emetic* may be given, composed of ipecac. ℈j cum antim. tart. gr. j, and followed by a good dose of calomel, and by black draughts (F. 4) containing a few grains of soda, every six or eight hours, as long as they bring away hardened lumps of fœces, or as long as the secretions continue to amend under their use. If, however, the patient be weak, an emetic of ammon. sesquicarb., pulv. ipecac. ää gr. x, cum inf. anthemidis tepid. f℥vj, may be substituted for the tartar emetic. If the constitution be very much broken down, or if there be symptoms of early coma or typhoid debility, Copland recommends the calomel to be combined with camphor, and to be followed by the turpentine draught (F. 18) or turpentine enemata. *Bleeding* will be required if the patient be young and vigorous, the pulse full and strong, the face flushed, and delirium active;—and if the inflamed part be full, tense, and vividly red, and especially if seated on the head or throat. In similar active inflammatory cases, *calomel* may be given in doses of gr. ii 6tâ quaque horâ; or *colchicum* in doses of ♏xx of the wine; and *saline draughts* with excess of alkali, (such as F. 5, or liq. am. acet. &c.) in the intervals;—but, in most *simple* cases, the latter with a small dose of mercury at night will suffice. For it must be recollected that antiphlogistic measures will very rarely *cut short* the disease,—although they may moderate excitement, and prevent local disorganisation. *Bark* should be given in

all cases as soon as the tongue becomes clean and the skin moist; or if the pulse be soft, tremulous, or very rapid, the heat moderate, and the delirium low and muttering;—or if the patient be naturally delicate, and subject to periodic or recurrent attacks;—or if antiphlogistic measures do not arrest the disease, or if suppuration or sloughing have commenced. If there be any doubt of its propriety, it should be given in small doses, with liq. am. acet.;—but in decided cases of debility, with the acids or ammonia,—and with wine, (or gin, if the patient be used to it,) opium, beef-tea, &c. *Opium* may be given in full doses at bedtime in the later stages, (to allay restlessness,) provided there be no cerebral congestion nor coma. In the *gastric variety*, small repeated doses of hydr. c. creta et pulv. ipec. c. should be given with effervescing draughts; and fomentations or rubefacients be applied to the abdomen.

Local Measures.—Leeches are useful in the early stages, provided the patient can bear the loss of blood;—*Minute punctures* about one eighth of an inch deep, made with the point of a lancet, have been recommended as substitutes; but they are very inefficient as a means of abstracting blood, and cause considerable pain.

Cold Lotions may be used when the heat is great and the pulse good, and especially in erysipelas of the head. But they must be avoided if there is any appearance of weakness, or if the erysipelas be *recurrent*, and manifestly connected with gastric irritation. *Warm*, or *tepid* fomentations of dec. papav. vel cydonii should be preferred in cases arising from local irritation; and perhaps are safest at all times. *Flour*, is well calculated to allay the heat and itching of simple erysipelas, and to absorb the acrid serum that escapes from the vesications. *Pressure* by bandages is serviceable in the latter stage of most cases;—and *from the very first*, if the inflammation be atonic and œdematous. *Mercurial ointment* smeared on the part, or applied as a plaster, has been much praised. The *nitrate of silver* in substance or solution;—or *blisters*, or fomentation of dec. cydonii oj. cum liq. am. sesquicarb. ℥j, are of great use in putting a stop to tedious cases of simple erysipelas, after proper constitutional remedies have been used. When there is a tendency to sinking, warm cloths moistened with turpentine or sp. camp. may be applied externally, whilst diffusive stimulants are administered internally. The *extension of the disease may be arrested* by applying a strip of blistering plaster, or still better, the arg. nit., so as completely to encircle the inflamed part. The skin should be well washed first, and care should be taken to leave no interstices through which the disease might creep and extend itself. *Incisions* are imperatively demanded in phlegmonous erysipelas, when there is extreme and rapidly increasing swelling and great tension;—or if there is the least sense of *fluctuation* or of a *quag*;—or if the skin is becoming dusky or livid. They often cut short the inflammation, and prevent sloughing, and they are

necessary for the discharge of matter and sloughs when formed;—for, as James observes, these matters are neither brought to the surface by pointing, nor walled in by adhesions. They are also requisite in erysipelas of the throat, when great swelling threatens suffocation. They should be made of sufficient length,—in as many places as required;—they should be carried quite deeply through the diseased tissues, and should be repeated as often as necessary. They should not be permitted to bleed longer than the strength permits;—and hæmorrhage, if profuse, is best stopped by laying the fingers in the wound. The subsequent measures are poultices, followed by stimulating dressings (as in carbuncle) and bandages, to prevent lodgment of matter and sinuses.*

SECTION II.—TUMORS.

I. General Hypertrophy.—The skin may grow into pendulous flaps or ridges, which, if inconvenient, are to be removed by incision.

II. Warts consist of elongated papillæ of the cutis, clothed with cuticle. When the latter is thin, which frequently happens when they are situated near the genitals, the warts are *soft*, and may exude a serous discharge. They may be produced by local irritation, but very frequently they arise and disappear without any assignable cause. Warts are frequently reliques of venereal sores, but although they may be produced by infection, they require no mercury. The best remedies for destroying them are stimulants;—argenti nitras—liq. hydrarg. oxymur—tinct. ferri sesquichloridi, liq. plumbi diacetatis—pulv. sabinæ—liq. arsenical.—liq. aluminis comp.—or the juice of the spurge, or of the sumach. If their shape permit, they may be snipped off or tied;—or if in very inconvenient situations, (as about the finger nails,) may be cut out;—but the surface from which they grew requires some astringent to be frequently applied, in order to prevent their reproduction.

Corns are growths of hard cuticle. They should be very frequently immersed in hot water, and be kept constantly covered with plasters composed of equal parts of soap plaster and oil spread on soft leather. Several plasters should be worn at once, each having a hole punched in it, to receive the corn; which will be thus relieved from pressure. When it has become soft and sodden, an oblique incision should be made with a lancet completely round it, and converging to its centre;—but without cutting deeply enough to wound the skin. When enough of it has been detached in this

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* Vide James, op. cit.; Copland, Dict.; Higginbottom on Nitrate of Silver; Copland Hutchinson's Surgical Observations, and the Lectures of Abernethy, Cooper, and Lawrence.

manner, it should be twisted round with a pair of forceps, till the root is pulled out. But if this operation cannot be done, as much of it as possible should be frequently scraped or shaved off.

III. BUNIONS are corns situated on the ball of the great toe, and complicated with enlargement of the bursa beneath. The cuticle should be softened and scraped off as directed for corns, and mercurial plasters, placed so as to take off pressure from the tender parts, should be constantly worn. If they inflame, every endeavour should be made by leeches, &c., to prevent suppuration, and the necessity of opening, which would lead to obstinate ulcers.

IV. HORNY TUMORS are formed by an inspissation of the matter of the sebaceous follicles, and are easily removed by two small incisions.

SECTION III.—MALIGNANT AND INTRACTABLE ULCERS.

These may be of two orders. 1. The *really malignant* formations, depending on constitutional vice, implicating the glands, and appearing in several remote organs;—as *scirrhus*, which begins as a hard lump that gradually degenerates into *cancer*. 2. The following ulcerations, which, though *locally* destructive, do not taint the system, nor reappear if removed effectually.

THE CANCEROUS ULCER (*Lepoides*) occurs on the face of old people, especially below the under eyelid. It begins with a flat, brown irregular crust, like a wart;—which falling off displays an ulcer with slightly elevated edges, but no hardened base. Its progress is slow; it is unaccompanied by hæmorrhage, and it occasionally cicatrises for a time. *Treatment.* The knife. In some few cases, arsenic, or the chloride of zinc, may be used instead.*

LUPUS. (*Noli me tangere, Herpes exedens.*)—A portion of the skin of the face (mostly on or near the *alæ nasi*) inflames, swells, and becomes of a bright red tint. The swelling frequently occurs in the form of one or more *tubercles*. The inflamed surface becomes excoriated, and secretes an ichorous matter which dries into a scab. After a time, a painful, foul, excavated ulcer forms;—variable in its progress, sometimes stationary, or partially cicatrising;—but, in the end, destroying the flesh of the nose and cheek; and causing caries and exfoliation of the bones;—till the patient, a horrid spectacle, dies worn out with pain;—his eye dropping from its socket into the chasm made by the destruction of the cheek. This affection mostly occurs in adults;—especially if of weakly habits, vitiated by intemperance and gross feeding.

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* Cæsar Hawkins in M. C. T., vol. xxi.; Warren on Tumors, Boston, 1837.

A milder form (*herpes, vel lupus non exedens*) attacks scrofulous children. It begins with shining tubercles, which ulcerate;—but the ulceration has a tendency to spread *widely*, rather than *deeply*;—causing prodigious deformity by the successive ulceration and puckered cicatrisation of the face. *Treatment.* The indications are, 1st. To correct the general health;—and abate inflammation;—by opening the bowels;—by keeping up the secretions; allaying irritation, and promoting appetite and digestion;—by regulating the diet; and by the application of poultices, or narcotic soothing fomentations, whilst pain and inflammation are acute. 2ndly. To alter the diseased action by various stimulants. If ulceration has not commenced, the part should be rubbed frequently with nitrate of silver, so as to keep it constantly covered with a black crust. If ulceration has commenced, the nitrate may be applied in the same manner;—or in the form of a lotion. But the best applications for ulcerated lupus are the arsenical. Now, arsenical applications should be either *very weak* or *very strong*; they should either produce *mild stimulation* or *sphacelus*. The weak may be tried first;—in the form of a lotion composed of ℥ii—℥iv liq. arsenical. ad. ℥j aquæ, in order to act as a mild stimulant and alterative. If this do not produce marked good effects, a strong ointment (℥j ad ℥j) or lotion of arsenic should be applied, so as completely to kill the diseased surface;—and when the slough is thrown off, the ulcer may be treated with the nitrate of silver as before;—and the escharotic may be reapplied if a destructive action be resumed.*

CHAPTER III.

OF DISEASES AND INJURIES OF MUSCLES, TENDONS, AND BURSÆ.

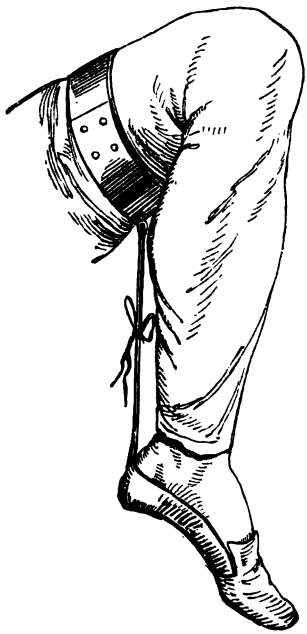
MUSCLES.—Two forms of muscular atrophy may come under the surgeon's observation. 1. *Rigid atrophy*;—the muscle becoming short, rigid, and inextensile;—and causing various deformities, as *club-foot, wry neck*, contraction of the wrist, &c. *Treatment.* Permanent extension by means of splints, &c., with repeated fomentations and oily embrocations;—and if these fail, the muscle or tendon must be divided.

2. *Acute atrophy.* Rapid wasting of one or more muscles, caused by cold, and attended with great pain and tenderness in the course

* Earle in M. C. T., vol. xii.; Travers, ibid. vol. xv.

of their nerves. This affection is rare. It has never been relieved by any means that could be devised.

TENDONS.—A *strain* signifies a violent stretching of ligamentous parts, with or without partial rupture. It causes considerable pain and inflammation, with subsequent weakness and stiffness that may last for life. *Treatment.* (1.) Inflammation must be counteracted by perfect *rest*, (upon a splint,) with bleeding, (if required,) leeches, and the antiphlogistic regimen generally. Hot applications usually give more relief than cold. (2.) Subsequently, the indications are to procure absorption of thickening, and restore the parts to their accustomed uses by *friction*, with mercurial and other liniments;—successive blisters;—passive motion; shampooing, hot and cold affusion, electricity, and other measures as recommended for chronic inflammation of synovial membranes. Care must be taken not to over-stimulate;—and if there be any return of heat and pain,—or if there be obstinate aching at night, leeches, low diet, and alteratives should be resorted to.



2. *Rupture* of tendons may be caused by violent contraction of their muscles. It is known by a sudden pain and snap, following some active exertion. The muscle is palsied; and the natural prominence of the tendon is lost. The *tendo Achillis* most frequently suffers. This injury is repaired by *callus*, just like bone. *Treatment.* Inflammation must be obviated, and the divided parts be kept at perfect rest and in apposition. The limb must be confined in such a posture that the muscle may be relaxed. For rupture of the tendo Achillis nothing can be better than the simple apparatus represented in the adjoining figure. Passive motion may be commenced in three weeks;—but the

patient must not straighten the knee by his own efforts for a long time;—and he must walk with the heel of his boot raised, so as to prevent stretching of the callus.

3. *Acute inflammation of Fasciæ* is attended with extreme pain and fever, and slight but tense and resisting swelling. It is generally caused by punctured wounds;—especially puncture of the fascia of the biceps during venæsection;—and punctures of the fingers, inflammation of the tendinous sheaths of which is called *thecal abscess; paronychia gravis*, or *tendinous whitlow*. It may lead to suppuration:—the matter extending itself along muscles and tendons—from the fingers to the forearm —causing sloughing of the tendons—severe irritative fever — life often obliged to be saved by amputation—or the limb, if preserved, stiff and useless. *Treatment.* Every local and general antiphlogistic measure should be used first; but if pain and tension increase notwithstanding, free incisions should be made in order to give vent to matter, if it have formed—or by creating a free discharge of blood, to prevent its formation. If the finger be the part affected, it should be freely laid open with a scalpel. If matter have extended into the palm, the incision should be continued along the metacarpal bone till it freely gushes out. It is better not to cut into the spaces *between* the metacarpal bones, (unless matter points there very decidedly indeed) for fear of wounding the digital artery. If it be necessary to slit up the palmar fascia, a cut should be made over the head of a metacarpal bone, in order that a director may be passed under it.

Whitlow.—There are two other varieties of whitlow. 1. The *cutaneous; i. e.* inflammation of the skin of the last phalanx; with burning pain, and effusion of a serous or bloody fluid under the cuticle. 2. The *subcutaneous;* with greater pain and throbbing, and suppuration *under* the skin. *Treatment.* Search should be made for thorns or other foreign particles sticking in the skin;—and leeches, purgatives, fomentation in very hot water;—pressure, so as to stop the arterial pulsation in the inflamed part, or the application of arg. nitras, may be tried in order to cause resolution. But in general the complaint may be cut short much more easily by an incision;—which should be rather long, otherwise it may be closed by fungous granulations, and the matter may burrow and do fresh mischief. Tonics and alteratives are mostly of service.*

4. *Subacute inflammation* sometimes affects the fasciæ of the forearm, hand, and neck; producing pain and tenderness, with spasm of the subjacent muscles. *Treatment.* Leeches, fomentations, blisters, mercurial camphorated liniments; local hot air bath; very small doses of colchicum and Dover's powder at bedtime, with a purge in the morning; or blue pill administered so as to cause incipient ptyalism.

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* James, op. cit. Edin. Med. and Surg. Journ. 1828.

5. *Tumors.*—Small tumors, mostly indolent, sometimes painful, may form in the tendons or fasciæ after strains—or perhaps without any assignable cause. If left to themselves, they mostly disappear; if troublesome, they must be treated by leeches, blisters, and mercurial frictions.

6. *Chalk stone deposit* consists of the lithate (urate) of soda. It may in gouty subjects be secreted into any texture—bone, joints, or cellular tissue;—but most frequently into the cellular tissue that environs the tendons of the feet or hands. The tumors which this substance forms are not always inorganic, but may be permeated by exquisitely sensible threads of cellular membrane. After remaining indolent for a variable time, they inflame the superjacent skin, and cause the formation of ulcers that are extremely obstinate, and discharge vast quantities of the concretion. They must be treated with simple dressings. It is rarely expedient to meddle with these tumors with the knife; but if any one be very inconveniently situated, and be perfectly indolent, it may be extirpated. The wound must be expected to heal very slowly.

Bursæ and Synovial Sheaths.—*Acute inflammation* most frequently attacks the bursa over the patella, constituting the *housemaid's knee*;—an affection so called because it is frequently induced in that class of females by kneeling on hard damp stones. It is distinguished from acute inflammation of the synovial membrane of the knee, by the superficiality of the swelling,—by its being more prominent in front than at the sides, and by the difficulty of feeling the patella. *Treatment.* Rest, purgatives, leeches, &c.; but if suppuration occur, the swelling should be punctured and treated as an acute abscess.

2. The bursæ and synovial sheaths (especially of the wrist) are liable to *chronic inflammation* and distension with synovia. Distended bursæ may be known from other encysted swellings by their situation;—over the patella or olecranon, or inferior angle of the scapula, or internal condyle of the tibia. *Ganglia* are small encysted swellings formed by increased secretion into the tendinous sheaths, especially of the fingers or wrist. *Treatment.* 1. Any rheumatic or gouty tendency, or any local inflammation, must be removed by proper measures. 2. If a ganglion be small, recently formed, and seated over a bone, a smart blow with the back of a book may rupture the sac, and cause its contents to pass into the cellular tissue, whence they will be absorbed. 3. Otherwise, blisters, frictions, &c., and other means that need not be recapitulated, should be applied, in order to excite absorption. 4. If these fail, the sac may be repeatedly punctured with a *grooved* or *acupuncture needle*, so as to let the fluid escape either into the cellular tissue or externally. In the mean time pressure and cold lotions should be used to prevent its reaccumulation. If this succeed no better, the swelling (provided it be a small superficial bursa or ganglion) may be dissected out;—or, if it be larger and deeper seated, may be punc-

tured with a lancet, when it will probably suppurate, and heal like an abscess;—but all operations on *large tendinous sheaths* (as at the wrist) should be confined to the needle, for fear of exciting acute inflammation;—which, in every case, should be most sedulously guarded against.

3. *Loose cartilages* sometimes form in the tendinous sheaths of the hand and foot, and cause more or less impairment of motion. They must be treated the same as when occurring in joints.

CHAPTER IV.

OF THE DISEASES AND INJURIES OF THE LYMPHATICS.

ACUTE INFLAMMATION of lymphatic *glands* has already been exemplified when speaking of bubo. The inflamed gland enlarges rapidly, and forms a hard, tense swelling, with great pain and fever. If it suppurate, the matter is formed in the cellular tissue around it, or between it and the skin, and the case proceeds as an acute abscess. This affection may (like acute abscess) be caused, (1.) By constitutioual disorder. (2.) By local violence. (3.) By the irritation (or absorption of acrid matter) from ulcers, venereal or otherwise. (4.) By simple injuries, a clean prick, for instance, in persons whose health is deranged. (5.) By punctures inoculated with some irritant fluid, perhaps from a putrid body. In the three last cases, the absorbent vessels leading from the injured part to the nearest glands are mostly inflamed likewise, appearing as red lines along the skin, and feeling hard, cordy, and tender. *Diagnosis.* Inflammation of the lymphatics, when a consequence of dissection wounds, may be distinguished from the typhoid malady arising from the same cause, (Part iii. Chap. ix.) by the simple inflammatory character of the constitutional symptoms. It begins with swelling and festering of the original wound, from which red lines extend up the arm;—these may stop at, or may not even reach the elbow; and there may be very little or no febrile disturbance. But, in severe cases, the glands in the axilla swell and become exquisitely painful;—there is great fever; the pulse is rapid, full, and hard;—matter is formed; and if it be confined by fasciæ, and not evacuated by art, the nervous system may sink under the excruciating pain, and the patient may die. If the matter is discharged, he recovers his health without much difficulty. A comparison of these symptoms with those of the other affection will readily show their intrinsic difference,—although, as was before said, it is very possible that both may be combined. *Treatment.* Acute inflam-

mation of the lymphatics. arising from local injury, from constitutional causes, or from the irritation of ordinary ulcers, must be treated by local and general antiphlogistic measures, that require no comment. If it be produced by slight injuries, whether in dissection or otherwise, the original wound should be dilated, and then be assiduously fomented; lunar caustic should be applied to the skin over the inflamed lymphatic vessels, and the bowels should be cleared. If the axillary glands are affected, and the pulse is full and hard, venæsection should be performed, and even repeated according to its influence on the pain and on the pulse;—calomel should be frequently administered, and the swelled parts should be covered with leeches and fomentations. Incisions should be made early wherever matter is suspected to exist, or is likely to be formed; and when fever abates, the patient's health should be recruited by tonics and change of air, and care be taken to prevent the formation of sinuses.

Chronic Glandular Tumors may be owing to simple chronic inflammation, sarcomatous transformation, or scrofula, or to scirrhus, or other malignant disease. (1.) *Chronic Inflammation* causes a tender swelling, with aching pain, and slight redness of the skin. It may be caused by any slight irritation in the course of the lymphatics, but is more frequently constitutional. *Treatment.*—Repeated leechings, cold lotions, and aperients, followed by alteratives and tonics. (2.) *Glandular sarcoma* (non-malignant scirrhus) consists in the transformation of one or more glands (especially in the neck) into sarcomatous tumors, whose characters and treatment have been before described, (page 193.) These are to be distinguished from scrofulous tumors by the circumstance, that one or two glands only are enlarged, and that they grow slowly but steadily;—whereas in scrofula a whole cluster is enlarged, and they are subject to fits of swelling and subsidence, from constitutional changes or atmospheric vicissitudes. From scirrhus and fungus medullaris they may be distinguished by attention to the diagnostic signs of those maladies.*

CHAPTER V.

OF THE DISEASES AND INJURIES OF BONES.

SECTION I.—OF THE DISEASES.

I. Simple Exostosis signifies a tumor formed by the hypertrophy or irregular growth of bone. These tumors are hard, indo-

* Warren, op. cit.

lent, and irregular, and mostly situated on the humerus or femur, especially near the insertion of the adductor magnus. Their *shape* is sometimes broad and flat; sometimes rounded and prominent, with a narrow neck. Their *structure* is that of ordinary bone, either dense like the cortical substance, or porous like the cancelli. They cause no pain unless they press on nerves or arteries; but when growing from the internal surface of the cranium or orbit, they of course give rise to the most serious evils. Their *cause* is generally unknown; sometimes, however, they can be traced to pressure or a blow. They sometimes appear during growth, and spontaneously disappear.

Treatment.—Blisters, stimulating plasters, and friction with ointments of iodine or mercury, may be tried, in order to produce absorption. If they do not succeed, the tumor may be sawn off at its neck; or, supposing that its base is broad, so that this cannot be done, its periosteum may be shaved off; after which it will probably perish by necrosis, or else waste away. Inflammation must be guarded against after these operations; for it may possibly affect the whole bone, and the joints at either extremity, and lead to very disagreeable consequences.

II. Rickets is a disease of scrofulous children, consisting in general weakness of the bones. Their cortex is thin, and their internal structure very spongy; the cells large, and filled with gelatinous fluid;—sometimes the bones are as soft as cartilage. There may be every degree of this malady. The ankles only may be a little sunk, or the knees bent, or the spine curved;—but in aggravated cases the head is swelled, the forehead prominent, the face triangular, the chin pointed, the teeth projecting, the chest narrow and prominent, the pelvis distorted, (the two acetabula approaching each other,) and the limbs short and crooked.

Treatment.—The health must be invigorated by the measures prescribed for scrofula. The child should not be permitted to stand or walk, if its legs are weak, but should be made to crawl on the carpet, and be carried about in the air; or at all events, when not using exercise, the patient should recline on a sofa. Mechanical supports, stays, irons, &c., are of use when the debility is partial, care being taken that they do not press injuriously on one part whilst supporting another.

III. Mollities Ossium (*Malacosteon*) is a disease of adult age. In some cases the bones are reduced to a mere shell, thin as a wafer, and filled with fat; in others they are soft, reddish, and spongy. This malady is incurable. It is mostly connected with some palpable disorder; such as fetid sweats, enormous deposits in the urine, or cancer, of which it is a very frequent attendant.

IV. Acute Inflammation of bone most frequently attacks the femur or tibia in children, and is usually attributed to cold. Frequently more than one bone is affected, but the articular extremities are not often involved.

The *symptoms* are shivering and fever, with great pain and swelling of the limb affected. If unrelieved, matter forms, burrows amongst the muscles, and at last points in several places. The patient may die from the violence of the inflammation, or from the profuse suppuration, but more frequently recovers, and the bone may be either left simply enlarged,—or it may have mortified.

Treatment.—Aperient and febrifuge medicines, with leeches and cold lotions, should be assiduously employed at first. As soon as fluctuation can be detected anywhere, an opening should be made; and it is better to do so too soon than too late. When a free exit is provided for the matter, a bandage should be applied to prevent its accumulation. If the patient seem likely to sink, amputation should be performed.

V. CHRONIC INFLAMMATION of bone is most frequently the result of some constitutional disorder, and generally attacks several bones simultaneously. It is denoted by slow enlargement, tenderness, weight, and pain. If caused by injury, it may lead to necrosis; but in general there is no organic change, save irregular enlargement.

Treatment.—Change of air, alteratives, tonics, and other measures to improve the general health, with leeches, blisters, issues, and mercurial or iodureted ointments and plasters locally.

VI. INFLAMMATION OF THE PERIOSTEUM is mostly partial, and occurs on the subcutaneous aspect of bones, especially of the tibia, the oval swellings which it produces being called *nodes*. If acute, or subacute, it may lead to suppuration and caries, or exfoliation; —if chronic, to a superficial formation of bone. The *causes* may be, exposure to cold, mechanical injury, disorder of the health, previous venereal taint, or abuse of mercury.

Treatment.—If acute, leeches, fomentations, purgatives, diaphoretics, or colchicum, or mercury;—if chronic, the same treatment as for chronic inflammation of bone. Supposing that the pain of acute periostitis is not relieved by the freest employment of the above-named measures, an incision should be made down to the bone;—and the same measure may be necessary in very painful chronic periostitis. It must also be done if matter form between the periosteum and bone, and no measures succeed in producing its absorption and alloying the pain; but it very often happens, especially in venereal cases, that mercury, (if not previously administered to excess,) or the iodide of potassium, and other remedies, will accomplish those objects.

VII. ABSCESS is a rare consequence of inflammation of bone. A cavity lined with a vascular membrane, and filled with pus, is formed in the substance of the bone, which may or may not be unusually dense around it. Abscess may be suspected when, in addition to permanent inflammatory enlargement and tenderness, (which may have lasted for years,) there is a fixed pain at one

particular spot, aggravated at night, and unrelieved by any remedy.

Treatment.—The bone must be laid bare by a crucial incision, and an opening be made with a trephine at the precise seat of pain; it may, if necessary, be deepened with a chisel. After the pus is evacuated, the wound must be left to granulate and cicatrise.

VIII. The term NECROSIS, although signifying the death or mortification of bone generically, is yet usually restricted to one form,—in which the whole or major part of the periphery of the shaft of a cylindrical bone dies, and is enclosed in a case of new bone. The term *exfoliation* signifies necrosis of a thin superficial layer, which is not encased in any shell of new bone.

1. NECROSIS is a frequent consequence of inflammation of the shafts of long bones in children, especially of the femur and tibia.

Pathology.—The bone dies;—its periosteum and the surrounding cellular tissue become infiltrated with lymph, which speedily ossifies, forms a new shell around the dead portion, and adheres to the living bone above and below it. In the majority of cases the *epiphyses*, or articular extremities, are fortunately unaffected. After a time, if the dead portion (which is technically called a *sequestrum*) is removed by art or accident, the newly-formed shell contracts, its cavity is abolished, and it gradually assumes the shape and function of the former bone.

Symptoms.—After acute inflammation, the bone remains permanently swelled; and the apertures, which were made for the discharge of matter, remain as sinuses, from which many sensitive, irritable granulations shoot. These sinuous apertures in the skin correspond to holes in the shell of new bone, (technically called *cloacæ*);—and if a probe be passed into them, the *sequestrum* may be felt loose in the interior.

Treatment.—The indication is to remove the *sequestrum*, which may be done as soon as the shell of new bone is sufficiently strong. An incision should be made so as to expose the surface of the bone,—and it should be made at a part where *cloacæ* exist, or where the bone is nearest the surface. Then the new shell must be perforated with the trephine, or with Hey's saw, or with a pair of strong bone forceps;—and the sequestrum must be drawn out. If it cannot be extracted entire, it should be divided with strong forceps. If the sequestrum be small, or the cloacæ large, the former may perhaps be extracted without any operation; and one way of enlarging the cloacæ is to dilate the sinuses in the skin, and keep them open with tents of lint. Necrosis of the articular extremities, or of the tarsus or carpus, involves the joints, and requires amputation.

2. EXFOLIATION, or death of a superficial layer, may be caused by any chemical or mechanical injury, or by stripping off the periosteum, the surface of the bone becoming white and dry. This last

accident, however, is not certainly followed by it; for the bone may remain red and moist, and throw out granulations like the soft parts. After a time the exfoliation separates, and the living surface forms granulations, which in some cases ossify and restore the deficiency.

Treatment.—During the separation of the dead portion, the best application is a weak lotion of nitric acid, or of the chlorides, to correct the fœtor, and perhaps hasten the process. Afterwards the case proceeds as a common ulcer.

IX. CARIES is an unhealthy inflammation of bone, essentially producing *softening*, and probably leading to ulceration and suppuration.

Pathology.—The bone is soft and red; its cells are filled with a red serous or thick glairy fluid;—and in scrofula there is a deposit of more or less tubercular matter. The bone, when macerated and dried, looks like sugar half dissolved by dipping into water.

Causes.—Caries most frequently attacks bones of a soft, spongy texture; such as the vertebræ, the round and flat bones, and the articular extremities of long bones. Its genuine cause is some constitutional disorder; scrofula, syphilis, or mercury.

Symptoms.—The bone permanently enlarged, and one or more unhealthy sinuses or ulcers,—into which if a probe be passed, it will readily break down the softened texture, which yields a gritty feel.

Treatment.—The indications are twofold;—to amend the system, and to remove or rectify the local disease. The former object must be accomplished by change of air, tonics and alteratives, and the measures that have been directed for scrofula and syphilis, supposing the caries to be connected with those maladies.

If it can be done, the best local remedy consists in freely exposing and removing the whole of the diseased portion of the bone by the chisel or trephine;—otherwise stimulating lotions must be used, in order to correct the diseased actions.

X. All the varieties of MALIGNANT DISEASE may be deposited in bone, and pass through the same stages, and lead to the same results, that they do in the soft parts. But there is one other form of malignant tumor, which exclusively affects bone. It is called *osteo-sarcoma*, or cartilaginous exostosis. On a section, it resembles cartilage in colour and consistence, and contains numerous cysts filled with a reddish fluid;—and a kind of bony skeleton, composed of thin plates or spiculæ, disposed arborescently like coral, is diffused throughout it. *Diagnosis.*—Malignant tumors of bone are distinguished by the rapidity of their growth, and by the pain which they occasion. *Treatment.*—Amputation, if it can be performed;—or at least extirpation.

SECTION II.—OF FRACTURE GENERALLY.

The term *Fracture*, with its varieties simple and compound, transverse, oblique, and comminuted, requires no definition.

CAUSES.—The *predisposing* causes are: (1) *Age*, which renders the bones soft and brittle. (2) *Disease*, such as mollities ossium, and cancer. (3) *Original conformation*; the bones of some persons being exceedingly brittle, although there may be no assignable disease. The *exciting causes* are two: mechanical violence and muscular action. *Mechanical violence* may be *direct* or *indirect*. The former causes a fracture at the part to which it is applied;—in the latter, the force is applied to two parts of the bone, and the fracture occurs in the intermediate space. A familiar instance of this is afforded by fracture of the clavicle from a fall on the shoulder;—the sternal end of the bone is acted on by the weight of the body, the acromial end by the resistance of the object which it falls against; and the bone, acted upon by these two forces, gives way in the middle.

REPARATION.—The reparation of fractures consists essentially in the effusion and organisation of lymph. But this process varies considerably as it occurs in different bones.

1. After fracture of ordinary bones, a quantity of lymph is effused into the cellular tissue around the broken part. This, in two or three weeks, becomes converted into a cartilaginous capsule, called a *provisional callus*, which completely surrounds the fracture, and adheres firmly to the bone above and below it. In two or three weeks more, the provisional callus ossifies;—and then the use of the bone is restored. But at this time the ends of the fractured bones are not *directly* united; and if the provisional callus were removed, they would still be separable;—in the course of five or six months, however, ossific matter is gradually deposited between them, and the provisional callus is absorbed. If a portion, or even the whole of a bone, (which when fractured unites by provisional callus) be extirpated, and its periosteum with it, the surrounding textures will, in general, effuse lymph, which speedily ossifies, and supplies its place.*

2. After fracture of the *cranium*, *olecranon*, *patella*, *cervix femoris*, or of any other bone invested with synovial membrane, no provisional callus is formed. If the broken parts are kept in the very strictest apposition, bony union will certainly occur in two or three months. But if a portion of the skull be removed;—or if after fracture of it, or of the other bones in the same category, the divided parts be not kept in the closest apposition, union or restoration will not be completed for years; the small quantity of lymph effused is converted into ligament, which very slowly ossifies.

SYMPTOMS.—The essential symptoms of fracture are three.

* Vide Med. Gaz., July 29, 1837.

(1) *Deformity*, such as bending, or shortening, or twisting of the injured limb. (2) *Preternatural mobility*,—one end of the bone moving independently of the other, or one part of it yielding when pressed upon. (3) *Crepitus*,—a grating heard and felt when the broken ends are *drawn into their natural places*, and rubbed against each other. The causes of displacement and deformity are three. (1) The *violence* which caused the fracture, as when the *ossa nasi* are driven in. (2) The *weight* of the parts below, which causes the sinking of the shoulder when the clavicle is broken. (3) *Muscular action*, which may produce bending, shortening, or twisting, according to circumstances.

TREATMENT.—The general indications are two. (1) To procure union. (2) To prevent deformity. For the first purpose are required *rest and apposition*,—for the second *position*, *extension* and *support*.

APPARATUS.—When preparing to treat a fracture that requires confinement to bed, the surgeon should take care that the *sacking* of the bed is well stretched and level. Then he must get his apparatus ready;—bandages and splints being all that are required in most cases. A *many tailed bandage* is very convenient in fractures of the lower extremity. It is easily made thus. Take a piece of bandage, rather longer than the injured limb; cut another bandage into pieces, each of which should be longer by one half than the circumference of that part of the limb which it is to be applied to; lay these pieces at right angles across the first, (beginning with those that are to encircle the upper part of the limb,) in such a manner that each shall overlap one third of the preceding one. When these transverse pieces are sewn on to the longitudinal, the bandage is ready for use. *Splints* should be made of wood, or of thin, flexible wood covered with leather. Or, instead of splints, the fracture (when swelling has subsided) may be enveloped in a mould of plaster of Paris; or the limb may be first simply bandaged, and then be enveloped in several layers of rollers, thoroughly imbued with a thick mucilage of gum or starch, and having between them several longitudinal pieces of lint and of pasteboard dipped in the same. These when dry form a light but firm and accurately-fitting support.

Everything being ready, the surgeon must, 1st, place the part in such a *position* as will relax the principal muscles that cause displacement. 2ndly, The fracture must be *reduced* or *set*; which is effected by *counter extension*; that is, fixing one end of the bone;—whilst the other is *extended*, or drawn in such a direction as to restore the limb to its proper length and shape. The *extension* must be made firmly, but gradually and gently; otherwise it will excite muscular spasm. 3rdly, Then the bandage is to be applied, in order to prevent contraction of the muscles; and lastly, the splints (which should be long enough to rest against

the projecting ends of the bone) or the gum contrivances may be substituted, if preferred.

The only other treatment required will be rest; aperients, (if they can be given without disturbance,) and cold if agreeable. If, however, inflammation should be violent, bleeding and leeches must be employed according to circumstances.

SECTION III.—OF NON-UNION AND FALSE JOINT.

The cases in which bony union is not produced within the usual time, may be divided into two orders. (1) Those in which the reparative process is *very slowly, or not at all set up.* (2) Those in which it is *set up, but frustrated.*

1. The *causes* of non-union, or slow union, in the first order, are mostly constitutional. Old age, debility, gout, and cancer;—the supervention of an acute disease, and pregnancy;—which last seem to act by producing a determination of blood to other parts.

2. In the second order, the restorative processes are frustrated by *motion* and *disturbance.* And the lymph which should have constituted a callus is either converted into ligament, (*ligamentous union,*) or a *false joint* is formed; the ends of the bone being tipped with cartilage and synovial membrane, and surrounded with a ligamentous capsule.

TREATMENT.—In recent cases, the first thing to be tried is the application of some apparatus which will insure perfect rest, perfect apposition, and pressure of the broken ends against each other. Should this not succeed after a fair trial of two months, means must be adopted to excite the adhesive inflammation around the fracture;—by rubbing one end of the bone against the other;—or by making the patient walk on the limb, which must be first well supported with splints; and then the apparatus should be again firmly applied for six or eight weeks.* If this also fail, the *ultima ratio* consists in converting the simple into a compound fracture; viz. by passing a seton between the broken ends—or by cutting down on them, and shaving or sawing them off;—or rasping them off; or applying caustic to them. All these measures require caution, as they may produce great constitutional disturbance and profuse suppuration;—the first is the least objectionable.

SECTION IV.—OF COMPOUND FRACTURE.

DEFINITION.—A simple fracture may be attended with a wound; but unless the wound communicates with the fracture, the latter is not compound.

CAUSES.—Fracture may be rendered compound, (1) By the same injury which broke the bone. (2) By the bone being thrust through

* Amesbury, Syllabus of Lectures on Fractures, &c., with plates of apparatus.

the skin. (3) By subsequent ulceration or sloughing of the integuments.

DANGERS.—These are threefold. (1) The shock and collapse of the injury, which may thus prove fatal in a few hours, especially if much blood has been lost. (2) Inflammation, fever, and tetanus. (3) Hectic or typhoid fever, from excessive suppuration.

QUESTION OF AMPUTATION.—In order to decide upon the necessity of this operation, the extent of the injury and the restorative powers of the patient must be most carefully examined. If the bone be very much shattered and comminuted;—if the fracture extend into a joint, especially the knee;—if the soft parts are extensively torn or bruised;—if, in particular, the skin has been torn away, so that the wound cannot be closed; or if it be so injured that a large tract of it must slough;—if the patient is very old;—or much enfeebled, either by previous disease, or present loss of blood;—if the collapse of the injury is excessive and permanent;—amputation is probably requisite. Of course more may be hazarded in a young patient; or in an old person of a spare, firm habit, who has always been healthy and temperate, than in one who is bloated and plethoric, and in the constant habit of enfeebling his vital powers by over-stimulation and animal indulgence.

Laceration of arteries is a dangerous complication both of simple and compound fracture. It is detected by the great flow of blood, if there be a wound; and if not, by a rapid, diffused, and dark coloured tumefaction of the limb, with coldness and want of arterial pulsation in the parts below. If it be the *femoral*, amputation will most probably be required, because the vein may have been injured also;—if any other, (the anterior or posterior tibial, for instance,) it may be secured;—provided that there is no other valid cause for amputation, and that the required incision will not too much aggravate the injury to the soft parts. But, *cæteris paribus*, this accident is always an additional reason for amputation, if there be other circumstances rendering it probably expedient.

If amputation be decided on, it must be performed before the accession of fever and inflammation.

TREATMENT.—If it be determined to save the limb, it must first be placed in a proper position, and then the fracture must be reduced. If a sharp end of bone protrude, and it cannot easily be returned or kept in its place, it should be sawn off; sometimes it is right very slightly to dilate the wound in the skin. After reduction, the great object is to procure adhesion of the external wound, and the best application is a piece of lint dipped in blood;—then bandages and splints are to be used, taking care that the part is in such a position that its muscles are relaxed, that it may be dressed without disturbance. When inflammation and swelling come on, the bandages must be loosened, and cold, and perhaps leeches, applied. Opium, with antimony and saline draughts;—laxatives or enemata, if they can be given without disturbance;—

and sometimes, though rarely, bleeding, are the general remedies. The catheter should be used if required. The great object in the subsequent treatment is to prevent the lodgment of matter by sponging and pressing it out carefully at each dressing, and applying compresses to prevent its accumulation, and, if required, by making openings for its discharge. If, notwithstanding the employment of tonics, wine, and good diet, the patient seem likely to sink under the discharge and irritation, amputation is the last resource.

SECTION V.—OF PARTICULAR FRACTURES.

FRACTURE OF THE OSSA NASI.—*Treatment.* — The broken pieces are to be restored to their places as much as possible, either by the fingers, or by passing a strong probe or female catheter up the nostril;—or by a pair of dressing forceps, one blade being passed up the nostril, and the other applied externally, so that the fragment may be grasped between them. Lint dipped in oil may be introduced in order to keep the parts in their places, but it is very irritating and seldom required. Bleeding, leeches, purging, cold, &c., must be employed, according to circumstances, to remove the great swelling, ecchymosis, and headache, that attend this injury.

FRACTURE OF THE LOWER JAW most frequently occurs about the middle of the horizontal ramus, sometimes in children (though rarely) at the symphisis, and still more rarely at the angle, or in the ascending ramus. *Symptoms.*—It is known by pain, swelling, inability to move the jaw, and irregularity of the teeth; the anterior fragment being generally drawn downwards. The diagnosis of fracture of the *ascending ramus* will often be obscured by the great swelling. Great pain and difficulty of motion are the chief signs. *Treatment.*—A piece of pasteboard, softened in boiling water, should be accurately fitted to the jaw, and then a four-tailed bandage should be applied. This is made by taking a yard and a half of wide roller, and tearing each end longitudinally, so as to leave about eight inches in the middle, which should have a short slit in it. The chin is to be put into this slit, and then two of the tails are to be tied over the crown of the head, so as to fix the lower jaw against the upper, and the other two are to be fastened behind the head. The teeth may be fastened together with dentists' silk. It is occasionally useful to place a piece of cork, grooved above and below, between the molar teeth on each side. Sometimes a tooth falls down between the broken parts; a circumstance which should be looked to, if there is much difficulty in fitting them together. If the above simple means do not suffice to keep the fractured parts in contact, Mr. Lonsdale's apparatus should be used;—and perhaps it would be well to adopt it in all cases, after

the primary swelling and tenderness have subsided. It affords perfect support, and yet allows of free motion.* The patient for the first few days must be fed entirely with gruel, broth, &c.

FRACTURE OF THE CLAVICLE is most frequently *situated* at the middle of the bone, and is *caused* by falls on the arm or shoulder, more frequently than by direct violence. *Symptoms.*—The patient complains of inability to lift the affected arm, and supports it at the elbow. The shoulder sinks *downwards*, *forwards*, and *inwards*; —the distance from acromion to sternum is less than on the sound side;—and the end of the *sternal* fragment of the bone projects as though it were displaced. *Treatment.*—The *indications* are to keep the shoulder *upwards*, *backwards*, and *outwards*. The broken parts may be *reduced*, (1) by putting the knee between the scapulæ and drawing the shoulders backwards; or, (2) by placing the elbow close to the trunk and a little forwards, and then pushing it upwards. To keep them in their places, (1) The *stellate* or *figure of 8 bandage* may be applied;—a roller being passed alternately round each shoulder, and made to cross on the back. A thick pad should be placed in the axilla first; and the elbow should be confined to the trunk by two or three turns of a roller afterwards. Finally, the arm is to be well raised with a sling. (2) If this method, together with perfect rest in bed, and aided with a straight splint across the back fastened to each shoulder, do not suffice to keep the broken parts in apposition, (although it will very rarely fail,) recourse must be had to apparatus. The commonest is the *clavicle bandage*, which consists of two loops for the shoulders, attached to two pads resting on the scapulæ, which are drawn together by straps and buckles. It is little, if at all, better than the figure of 8 bandage. *Amesbury's apparatus* seems constructed in a manner that prevents all possibility of displacement. If nothing else will do, it should be procured at an instrument-maker's.

FRACTURES OF THE SCAPULA.—The *body* of this bone may be broken across by great *direct* violence. *Crepitus* may be detected by placing one hand on the bone, and moving the shoulder or the inferior angle with the other. *Treatment.*—The roller must be passed round the trunk, and a few turns be made round the humerus, so as to fix the arm to the side, and prevent all motion. Bleeding, or at all events purging and low diet, will be required to avert inflammation of the chest.

Fracture of the *neck of the scapula* may be caused by falls, or blows on the front of the shoulder; but it is rare. *Symptoms.*—The shoulder is flattened and sunk; the deltoid is dragged down; and the head of the humerus can be felt in the axilla. The natural appearance of the parts is restored by slightly raising them; and *crepitus* may be felt, if one hand be placed on the *acromion*

* Lonsdale on Fractures. Lond. 1838.

with the forefinger on the *coracoid* process, whilst the humerus is gently moved. *Treatment.*—A pad in the axilla; a *short sling* from the axilla to the opposite shoulder;—a *long sling* from the elbow to the opposite shoulder; a *clavicle* or *figure of* 8 *bandage;* and a roller to confine the humerus to the trunk, will support the parts, and keep them in their proper position. Union may occur in seven weeks.

In *Fracture of the Acromion* the shoulder is sunk and flattened;—an inequality may be felt by tracing the spine of the scapula;—but, on raising the arm, the broken part is restored to its place. *Treatment.*—A pad is to be placed between the elbow and the side, in order to relax the deltoid; (but none in the axilla, otherwise the broken parts will be kept asunder;)—the humerus is to be confined to the trunk, and the *elbow to be well raised by a sling*, so that the head of the humerus may be lifted up against the detached piece of the acromion, and keep it in its place. Union is mostly ligamentous, owing to the difficulty of preserving strict apposition.

Fracture of the Coracoid is a rare accident, *caused* by sharp blows on the front of the shoulder. *Symptoms.*—Inability to bring the arm upwards and forwards;—and motion or crepitus of the detached process felt by pressing with the finger between the pectoralis major and deltoid. *Treatment.*—The humerus must be brought forwards and inwards, so as to relax the biceps and coracobrachialis, and must be confined to the trunk.

FRACTURE OF THE HUMERUS.—*Fracture of the shaft* will be known at a glance by the limb being bent, shortened, and helpless, and by the crepitus felt when it is handled. *Treatment.*—Reduction may be effected by drawing the elbow downwards. Then the whole limb, from the hand upwards, is to be evenly bandaged. Next, a long padded splint should be placed on the inner side, one end of it pressing against the axilla, the other against the inner condyle;—three others are to be placed on the other sides of the limb, and are to be fastened by tapes;—lastly, the limb may be confined to the side, for the sake of greater security.

Fracture of the neck of the humerus, in children, is most frequent at the *anatomical* neck;—that is, *above* the tubercles;—in the aged, it is usually at the *surgical* neck, or just *below* them. *Symptoms.*—Pain and incapability of moving the arm. There is no hollow below the acromion. The head of the bone may be felt in its socket, and the broken end of the shaft in the axilla. On grasping the former, the elbow may be moved independently of it. *Treatment.*—The same splints, bandages, &c., are to be used as in the last case; and a pad to be placed in the axilla. The forearm should be *lightly* supported with a sling, but neither in this nor in the last case should the elbow be forcibly raised. The great secret in managing both is to get a good purchase against the axilla and the inner condyle, with the innermost splint.

The *lower extremity of the humerus* may be broken in several

ways. (1) There may be an *oblique fracture above the condyles;* —which usually happens to children. The radius and ulna, with the lower fragment, are drawn upwards and backwards as in dislocation;—but the natural appearance of the parts is restored by extension. (2) Either *condyle* may be broken off; and the fracture may or may not extend into the joint. (3) There may be one fracture *between the two condyles*, and another separating them both *from the shaft*. In all these injuries, the motions of the joint are free, and are attended with crepitus above the elbow;—and the distance between the condyles of the humerus and the lower extremities of the radius and ulna is the same as on the sound side. *Treatment.*—Leeches, (or bleeding,) cold lotions, or ice, must be employed to reduce inflammation and swelling. Then the elbow being bent, and the arm bandaged as before, a pasteboard splint (made of pasteboard softened in hot water, and moulded to the parts whilst soft) should be applied, and afterwards an *angular* splint, composed of two pieces joined at a right angle;—one of which is placed behind the upper arm, and the other below the forearm. Another splint (if not prevented by tenderness) should be placed in front. *Passive motion* of the joint should be commenced in a fortnight or three weeks;—but it is very difficult to avoid all deformity and loss of motion.

FRACTURES OF THE FOREARM.—*Fracture of the olecranon* may be *caused* by direct force, or by violent action of the triceps muscle. *Symptoms.* The patient easily bends his limb, but has great pain and inability in straightening it. A hollow is felt at the back of the joint, because the broken part is drawn from half an inch to two inches up the arm; but sometimes, when the ligaments are not torn through, this displacement may be very trifling or altogether absent. *Treatment.*—The limb should be placed in a straight position, and leeches, &c. be used till swelling and tenderness subside. Then the forearm should be bandaged;—the olecranon should be drawn down as much as possible;—the roller, continued from the forearm, should be passed round above it, and then back again about the elbow in a figure of 8 form. Then the whole upper arm should be rolled to prevent contraction of the triceps; and a splint must be placed in front, so as to keep the arm straight. Passive motion should be commenced in three weeks. Union will be ligamentous, if there is any interspace between the fractured parts.

Fractures of the *coronoid process* is very rare. It has been caused by the action of the brachialis muscle. *Symptoms.*—Difficulty of bending the elbow;—and dislocation of the ulna,—the olecranon projecting backwards. *Treatment.*—The arm must be bandaged, and kept at rest in the bent position. Union will be ligamentous.

Fractures of the *shafts of the radius and ulna*, together or singly, are known by the ordinary signs of fracture, especially by the cre-

pitus felt on fixing one end, and rotating the other. The objects in the treatment are to prevent the fractured ends of either bone from being pressed inwards, and to prevent the upper fragment of the radius from being more *supinated* or *everted* than the lower. Fracture of the *lower extremity of the radius* may be combined with dislocation of the ulna, and may resemble dislocation of both bones at the carpus; but the *diagnosis* will be easy if the relative positions of the styloid process of the radius and the base of the thumb are attended to. It is an awkward accident, because the *pronator quadratus* may draw the lower fragment amongst the flexor tendons, which if not counteracted would greatly impair the use of the fingers. *Treatment.*—The treatment generally adopted is, to bandage the limb;—to place it with the thumb uppermost, and the elbow bent;—to apply one splint in front, and another behind;—and a third slight one along the ulna, if broken. If the radius alone be broken, (especially at its lower extremity,) the hand should be permitted to *drop*;—but if the ulna alone or both bones be fractured, the splints should extend to the ends of the fingers, and the hand be kept in a *line with the forearm.* But it is a better plan to place the forearm *quite supine*, with the palm uppermost;—then having reduced the fracture, to apply one splint below from the olecranon to the fingers' ends;—and another above from the bend of the elbow to the wrist.

FRACTURES OF THE HAND.—The *carpus* is rarely fractured without so much other injury as to render amputation necessary. Fracture of the *metacarpal bones*, or of the *phalanges*, will be readily recognised. No part of the hand should be amputated unless positively necessary, and even one finger should be saved if it can be done. *Treatment.*—For fractures of the carpus, metacarpus, or first phalanges, it is a good plan to make the patient grasp a ball of tow or some other soft substance, and bind his hand over it; or the hand may be supported on a flat wooden splint, cut into the shape of the thumb and fingers. If one finger only be fractured, it may be confined by a thin lath or pasteboard splint. It must be recollected that the palmar surfaces of the metacarpal and digital bones are concave. They must therefore be slightly padded before they are bound to any flat surface, or they will unite crookedly.

FRACTURE OF THE RIBS.—*Symptoms.*—Fixed lancinating pain, aggravated by inspiration, coughing, or any other motion. By tracing the outline of the bone, or by placing the hand upon it, crepitus may be felt during the act of coughing or inspiration, and the patient is sensible of it likewise. If the fracture be situated near the spine, or if the patient be very corpulent, it may be difficult to detect fracture with certainty, but the case should be treated as one, if pain on inspiration be complained of after a blow.

TREATMENT.—The indications are, (1) To *prevent all motion* of the ribs, by passing a broad flannel roller;—or a towel fastened

with tape round the chest so tightly, that respiration may be performed solely by the diaphragm;—(2) to *obviate inflammation* of the chest, and diminish the arterialising duties of the lungs by bleeding, purging, rest, and low diet. *Opiates* should be given for pain and cough.

If several ribs be broken on each side, it may happen that no bandage can be borne, and the case becomes highly serious. Quietude, depletion, and opiates are the only remedies.

Emphysema, a swelling caused by the presence of air in the cellular tissue, is an occasional complication of this fracture. The extremities of the fractured rib wound the lung. In the act of inspiration, air escapes from the lung into the cavity of the pleura, and from thence through the wound in the *pleura costalis* into the cellular tissue of the trunk. *Emphysema* forms a soft tumor, that crepitates and disperses on pressure. *Treatment.*—Provided the air escapes freely from the cavity of the chest, little inconvenience results, and if the skin be very much distended, it may be punctured. But if the air accumulate in the pleura and compress the lung, which will be known by great dyspnœa and a hollow sound on percussion,—and if the breathing is not relieved by free depletion, an aperture must be made into the chest to let the air escape.

Fracture of the Sternum.—*Symptoms.*—Crepitus is felt during inspiration or other movements of the trunk, and displacement (if any) can be detected by examination. *Treatment.*—The same as for fractured rib.

Fractures of the Pelvis can only be caused by most tremendous violence, and are generally attended with some fatal complication;—such as laceration of the bladder, or rectum, or of the great arteries or veins. The only thing to be done is, to place the patient at perfect rest, and in as easy a position as possible;—to keep a catheter in the bladder;—and to treat any symptoms that may arise. Fracture of the *os coccygis*, or of the lower extremity of the sacrum, might be caused by violent kicks or falls;—the former may occur in women who have children after the coccyx is united to the sacrum. The loose portions must be replaced by introducing the finger within the rectum, and the bowels must be kept *lax*, so that no disturbance may be occasioned by hard stools.

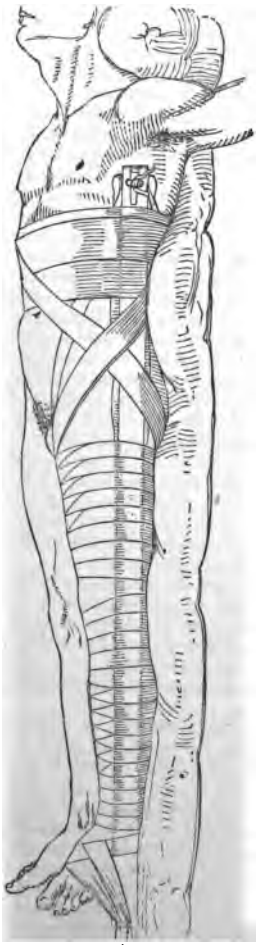
Fractures of the *os innominatum*, passing through the *acetabulum*, may be attended with various degrees of shortening of the thigh, as in dislocation. They may be known, however, by the crepitus felt on handling the *crista ilii*.

Fracture of the Femur.—Fracture of the *neck of the femur*, *internal* to the capsular ligament, may be caused, (1) by a slight force acting on the lower extremity of the limb, as happens in slipping off the curbstone;—or (2) by falls or blows on the hip. It is most frequent in the aged, and very rare in those under fifty; because, in addition to the changes which all the bones experience in advanced life, the thinness of the cortex, sponginess of the cancelli, deficiency of the bone earth, and loss of elasticity of the ani-

mal matter,—the neck of the femur is always peculiarly atrophied; it is *shortened*, and *sunk* from the oblique to the *horizontal* position;—changes that cannot fail to render it more easily fractured. This accident is more common in old women than old men. *Symptoms.*—After a blow or fall, the patient finds himself unable to stand, and complains of great pain increased by motion, and principally seated at the upper and inner part of the thigh. The leg is from half an inch to two inches shorter than the other;—the foot is turned out;—the heel rests in the interval between the ankle and tendo achillis of the other leg;—*crepitus* may be felt if one hand be placed on the trochanter, whilst the limb is *drawn to its proper length* and rotated;—the trochanter generally projects less than on the other side, and the limb may generally be freely moved, although with great pain. The *shortening* does not occur *immediately* after the accident;—and sometimes it is very trivial, or even wanting, if the fractured parts are locked together. In some very rare cases, the limb is turned inwards. *Pathology.—Transverse* fracture of the cervix femoris within the capsule very rarely unites by bone. 1. Because of the inadequate nutrition of the upper fragment, which is only supplied by the small vessels of the *ligamentum teres*. 2. Because the fracture, being separated from the cellular tissue by the capsular ligament, cannot be assisted by a provisional callus.* 3. Because the fractured surfaces cannot easily be kept in apposition, or pressed against each other. 4. Because the patients, being old, have neither time nor constitutional vigour sufficient to effect the cure. This fracture *may unite, by bone*, if the parts can be kept in apposition, and the age be not too advanced.† But, in ge-

* But bone is often formed on the *outside of the capsule*, both after this fracture and after disease of the joint.

† Stanley in M. C. T., vol. xx.



neral, it either unites by ligament, or the stump of the cervix becomes smooth and rounded, and plays in a socket formed by a hollowing and absorption of the head.*

Fracture *external to the capsular ligament* resembles the last in many general features, but differs in the following points. 1. It is always caused by *direct* violence. 2. It may occur in persons of any age. 3. It is *not attended with so much shortening and eversion.* 4. *Crepitus* is much more easily felt. 5. It may very easily unite by bone, if the patient's age or other circumstances do not prevent it. 6. It is attended with great fever, pain, and swelling—sometimes enough to prove fatal;—whereas, in fracture internal to the capsule caused by falls on the feet, there is very little local or constitutional disturbance after the first few days. *Treatment.*—(1) If the fracture be clearly *internal to the capsule*, and the patient *aged* and *decrepit*, no attempt should be made to procure osseous union; both because it would be unavailing, and because the patient's little remnant of health and strength would be sacrificed by the necessary confinement. But he should be kept in bed for a fortnight, till pain and tenderness abate;—then may get up and crawl about with crutches;—and in time he will regain a tole-

* Sir A. Cooper on Dislocations and Fractures of the Joints. 7th edit. 1831.

rable use of the limb, especially if not very corpulent. The sole of the shoe must be made thick enough to counteract the shortness of the limb. (2) But if the fracture be *certainly* or *probably external to the capsule*;—or if (although internal) the patient be *young* and *vigorous*, he should be placed upon Amesbury's *fracture-bed*. This consists of four planes, something like a W. The trunk is placed on the first;—the thighs on the second, (which can be made of any requisite length;)—the legs hang over the third;—and the feet are fixed to the fourth. There is a hole to admit of evacuations; and the patient can be so confined as to prevent any motion of trunk or body, together or singly. Both thighs must be extended to the same length;—the trochanter must be supported with a pad,—a long splint should be placed on the outside of the thigh;—and the two limbs should be fastened together. By these means union may probably occur in two or three months; or even if ligament form, it will be short. Another mode consists in employing the *long straight splint*. It ought to extend from the pelvis to the foot; and to have a foot-board with straps, &c. at the bottom, and two or three hooks or notches at the top. The patient is laid on his back;—the affected limb bandaged from the foot upwards;—the foot fastened to its board, and dragged forcibly down to its proper level;—and a bandage passed round the upper part of the thigh, and fastened tightly to the hooks at the top of the splint. The objections to this plan are, that it is irksome to the patient, and that the bandage round the upper part of the thigh tends to separate the fractured parts. A convenient modification of this splint, without a foot-board, employed by Mr. Liston, is represented in the figure in the preceding page.

Fracture of the femur *just below the trochanters* is liable to be followed by great deformity and non-union, because the upper fragment is tilted forwards by the psoas and iliacus muscles. *Treatment.*—The patient should be placed on a fracture-bed, with the trunk and thighs bent at a very acute angle, so as to relax the offending muscles. Three, or perhaps four, splints should be applied likewise.

Fracture of the *shaft* of the femur requires no observations as to its *causes* or *symptoms*. In the *treatment*, the great objects are to relax as many of the muscles as possible;—and to prevent the foot from being permanently turned out. (1) The best way is, either to use a *fracture-bed*, or a *double inclined plane*. The latter apparatus consists of two pieces like the letter A;—one for the thigh, the other for the leg, with a board to fasten the foot to. The whole limb must be bandaged;—the *thigh-piece* must be made accurately to correspond to the distance between the tuber ischii and the bend of the knee;—and then one splint is to be placed from the *great trochanter* to the *outer condyle*;—a second, from the ramus of the pubes to the inner condyle; and a third on the anterior surface of the limb. Perhaps it is a good plan to apply a fourth splint, from the *tuber ischii* to the *bend of the knee*,

before placing the limb on the double inclined plane. (2) *Pott's plan* consists in laying the patient on the affected side, the thigh at right angles to the trunk, and the knee bent—with a bandage and four splints, applied between the different points of bone that have just been mentioned. The disadvantages of this plan are, (1) that the patient soon turns round on his back, dragging the upper fragment away from its right place; and (2) that the pressure on the great trochanter may cause sloughing, &c. The first evil may be prevented simply by watching the patient, and telling him to turn round on his belly rather than on his back, if he wishes to shift his position. The second may be remedied by placing him on his back at the end of a fortnight, with his knees bent up and supported by pillows. But this plan is in no light so good as the first. (3) A *third plan*, that of the *long* straight splint before described, is not so good as either. It employs mere force to oppose the displacing tendency of the muscles, instead of relaxing them by position. If *both thighs* are broken, a fracture-bed should be employed;—or if there be not one, the patient should be placed on his back, with four splints to each thigh, and his knees drawn up, and supported by pillows. In the *oblique fracture* (extending *downwards and forwards*) of the *lower extremity* of the femur, the sharp end of the upper fragment is apt to pierce the extensor muscles, and the lower fragment to be dragged down into the ham by the gastrocnemius. *Treatment.* Firm extension must be kept up with the double inclined plane and splints;—and the knee must be well bent.

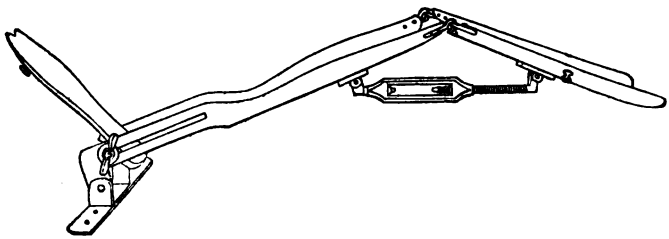
Fracture of the condyles into the knee joint mostly happens to old persons, and not unfrequently proves fatal. If much *comminuted*, or if *compound*, *amputation* will be necessary. Otherwise, the limb should be placed *straight*, so that the head of the tibia may keep the fractured parts in their places;—lotions and leeches should be used to prevent inflammation;—and afterwards a pasteboard splint. *Passive motion* should be commenced in five weeks.

Fracture of the Patella is generally transverse, and is *caused* by sudden contraction of the extensor muscles attached to it;—as, for instance, when a person who has his knee much bent under him, and is in danger of falling, tries to save himself by throwing the body forwards. *Symptoms.*—Inability to straighten the knee, and separation of the fractured parts, which can be readily felt. *Treatment.*—The limb must be laid straight, with the foot much raised, so that the extensor muscles may be relaxed. Leeches, &c., must be used till inflammation subsides;—and then, as soon as it can be borne, some apparatus must be employed to keep the broken surfaces as nearly in contact as possible. The most common consists of one pad, or strap, or bandage, placed above the patella, and a similar one below it;—the two are then approximated by longitudinal straps, or bandages passing between them. But the best apparatus conceivable is that invented by Mr.

Lonsdale; for it causes no circular constriction of the limb whatever. If the parts can be kept in *complete apposition*, the union may be bony;—if not, ligamentous; it is, however, a great object to have the ligament as short as possible.

Longitudinal or *comminuted* fractures of this bone, being caused by direct violence, will be attended with great inflammation;—which being subdued, the parts must be kept in their places by bandages and pasteboard splints. *Compound* fracture will generally require amputation;—unless the *wound is very small*;—the skin not injured enough to slough or ulcerate;—and the constitution very good.

Fractures of the Leg.—Fractures of the tibia and fibula may be readily distinguished by careful examination. Fracture of the *fibula alone* generally occurs about three inches above the outer ankle. *Treatment.*—If the head of the tibia be obliquely fractured into the knee joint, the limb should be placed straight, in order that the femur may keep the broken parts in their places;—inflammation must be subdued;—then pasteboard splints and bandages;—and lastly, passive motion in a month or five weeks. But if the fracture, although high up, do not affect the joint, it must be treated in the same manner as the other fractures of the leg. (1) The fracture being reduced by extension from knee and ankle, and the limb being enveloped in a *many-tailed* bandage, the patient should be laid on the affected side, with the knee and hip bent,—then one splint with a foot-piece should be applied along the outer side, another to the inner side, and a third slight one to the shin. The foot-piece should be padded, so as to prevent the foot from turning inwards or outwards;—especially the latter;—the general rule is, to *keep the great toe in a line with the inner edge of the patella*;—a rule applicable to all cases of injury below the knee. If the fracture be *very oblique*, and one fragment project, it must be repressed by a small additional pad, of sufficient thickness. (2) The *double inclined plane*, or some of the numberless modifications of it, (Amesbury's, Liston's, &c.,) are certainly more



convenient. No surgeon's *armamentarium* is complete without one. Care must be taken to pad the hollow above the heel sufficiently, but not too much. It is a great advantage to be able to press the fractured surfaces together by means of the foot-board, if the fracture be *transverse;* but if oblique, such pressure would increase displacement. With these apparatus, (or with the starch or gum contrivances,) the patient, at the end of a few days, may be moved to a sofa, or may walk about with crutches; but the limb must be supported by a sling round the neck, and must not be moved otherwise than passively. *Compound fracture* of the leg requires no remarks distinct from those that have been made on compound fracture generally.

FRACTURES OF THE FOOT will often be attended with so much other mischief as renders amputation expedient. But an attempt should be made to save part of it;—especially the ball of the great toe. Pasteboard splints and other contrivances must be used to preserve the proper position;—and if matter forms, there should be no delay in freely dividing the dense fasciæ of the foot, to let it escape.

CHAPTER VI.

OF THE DISEASES AND INJURIES OF JOINTS.

SECTION I.—OF THE SYNOVIAL MEMBRANE.

1. ACUTE INFLAMMATION is known by severe pain of the joint, aggravated by the slightest motion;—great swelling *occurring immediately after the pain;*—redness and tenderness of the skin, and fever. The swelling is peculiar. It is occasioned by a rapid effusion of fluid into the synovial cavity; and if the joint be superficial, it fluctuates freely. It is always most prominent where the joint is least covered by ligament. Thus, in the knee, it is most observable on each side of the patella, and at the lower and fore part of the thigh. In the elbow it is most distinct above the olecranon. In the hip and shoulder it is attended with general fulness of the surrounding muscles. *Causes.*—This disease may be *idiopathic;*—or it may arise in gouty or rheumatic habits;—or in those tainted with syphilis or mercury;—or it may be caused by cold or injuries, especially penetrating wounds. *Terminations.*—It may terminate in death, owing to extreme constitutional disturbances;—or it may pass into a chronic form, leaving the joint more or less impaired. *Prognosis.*—It is always more dangerous if it attack one joint alone;—or if it be produced by local causes,

than if it be a consequence of constitutional taint, and affect many joints. The danger in any case must be estimated by the constitutional disturbance present. *Morbid Anatomy.*—The membrane is found red;—the joint filled with turbid synovia mixed with flakes of lymph, or sometimes with pus;—and portions of the synovial membrane, and perhaps the subjacent cartilage, ulcerated. *Treatment.*—Bleeding, (if it can be borne,) leeches *to* the joint, or cupping *near* it;—ice, evaporating lotions, or hot fomentations, according to the patient's choice;—purgatives; salines with good doses of antimony;—and calomel with opium, to affect the system. The joint must be kept motionless by a splint. Blisters are injurious. If the disease be connected with gout or rheumatism, colchicum or the iodide of potassium may be given.

2. CHRONIC INFLAMMATION is known by pain, generally of a dull, aching kind, attended with a sense of weakness and relaxation;—which is not usually aggravated by pressure of the articular surfaces together. It is followed in a day or two by swelling of the characters before described, without redness of the skin. When there is mere swelling, with very little or no pain, the complaint is called *hydrops articuli*, or *hydrarthus*. This is the *first stage*. In the *second*, the synovial membrane and surrounding tissue become thickened and gristly, and the swelling loses its softness and fluctuation. In the *third*, the inflammation invades and destroys the other textures of the joint. *Causes.*—Same as of the acute. It rarely attacks those under puberty. *Treatment.*—The health must be amended, the bowels opened, and the diet regulated according to the wants of the system. Then, first, blood should be taken by leeches or cupping; and the part should be confined by a splint, and be bathed with cold lotions. Next, counter-irritation should be tried in every possible form, to remove the thickening and effusion of fluid: beginning with blisters, which should be applied in succession, (and not too near the joint, if it be superficial;) —and subsequently linimentum hydrargyri.;—liniments of turpentine, cantharides, and ammonia—F. 24,—ointment of tartar emetic—F. 38,—Scott's ointment,* (F. 25,) spread on lint—bandages;—affusion with hot water, vapour bath, &c. These and other measures should be used perseveringly, but with caution;—giving them up if they permanently increase heat or pain.

If the joint become very much distended, with constant pain, unmitigated by remedies, a grooved needle may be introduced, and a cupping glass be applied over it. If the fluid which escapes be

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* The surface of the joint should first be washed with spirit of wine, and should then be covered with the ointment thickly spread on lint; next, adhesive plaster should be evenly applied in strips, so as to form a complete casing for the joint; and lastly a bandage. The gum splints (p. 211) may be substituted for adhesive plaster.

pus, a puncture should be made with a lancet; and then a cure by *anchylosis* generally soon follows.

3. PULPY FUNGUS consists in the conversion of the synovial membrane (generally of the knee) into a thick pulpy substance of a light brown or reddish brown colour, intersected by white membranous lines. It produces, after a time, ulceration of the cartilages, caries of the bones, wasting of the ligaments, and abscesses in various places. *Symptoms.*—Gradually increasing stiffness and swelling of the joint, *without pain*;—the swelling less regular than that of chronic inflammation;—and not fluctuating, although so soft and elastic that it seems to do so. *Treatment.*—The progress of the disease may be retarded by rest and antiphlogistic measures; but after a longer or shorter duration of the indolent stage, ulceration of the cartilage and hectic come on, and the patient can only be saved by amputation.*

4. LOOSE CARTILAGES commence as little pendulous growths upon the synovial membrane, which become accidentally detached. *Symptoms.*—They can be felt, when they present themselves at the surface of the joint;—and when they get between the ends of the bones, they cause sudden excruciating pain, followed by inflammation. *Treatment.*—If possible, the cartilage should be fixed by bandages, so as to prevent it from getting between the bones;—otherwise it must be removed. The patient should be confined to his bed for two or three days before, and for several days after the operation. The cartilage should be well fixed;—its coverings slowly divided;—then it must be taken out with a tenaculum;—the wound be closed;—and the greatest care be taken to prevent inflammation.

5. PENDULOUS FLESHY OR GRISTLY TUMOURS may produce many of the symptoms of loose cartilages. They may perhaps be distinguished by being less hard. They have been extirpated from the knee, but of course with very great hazard to life.

SECTION II.—INFLAMMATION OF THE CELLULAR TISSUE.

Inflammation of the cellular tissue around a joint is manifested by a tolerably firm swelling, various in extent;—attended with slight obtuse pain, and caused by a deposition of lymph which renders the tissue hard and brawny. As it increases, the skin becomes distended, white, and shining, and the pain extreme. After this *adhesive stage* has lasted an uncertain number of months, suppuration occurs at one or more points—the abscesses burst through the synovial membrane, and cause irreparable disorganisation of the joint. *Treatment.*—Leeches or cupping, and cold lotions, followed after a time by Scott's ointment (F. 25.) Mr. Wickham deems counter-irritants and friction injurious.

* Brodie on Diseases of the Joints, 3rd edit.

SECTION III.—THE LIGAMENTS.

Weakness and elongation of ligaments must be remedied by mechanical support. Authors have described a form of inflammation of the ligaments of joints characterised by great pain from motions that shake or twist them. It must be treated like the subacute fascial inflammation, p. 202.

SECTION IV.—THE CARTILAGE.

Ulceration of cartilage may be a *primary* affection;—or it may be *secondary*; that is, dependent on inflammation of the synovial membrane, or of the bone. *Rapid ulceration* is frequently caused by acute inflammation of the synovial membrane, especially from wounds. The chronic form is also supposed by some to depend on a chronic inflammation of that membrane.

Chronic ulceration of cartilage begins with lameness and occasional pain. The pain soon increases, and becomes continued; it is felt deep in the joint,—resembles the gnawing of an animal;—and is attended with aching of some other part of the limb. As the disease advances, it becomes most excruciating;—depriving the sufferer of sleep, and exhausting his spirits; and may be accompanied with most painful muscular spasms. Both the pain in the joint and the remote pain are invariably aggravated by motion, or by pressure of the ends of the bones together. At first there is no swelling; it never appears in less than four or five weeks, and often not for months. When it does occur, it has the form of the joint, does not fluctuate, and depends on slight infiltration of the surrounding cellular tissue. *Terminations.*—In fortunate cases the ulcerated surface throws out lymph and heals;—or the lymph from two opposite surfaces becomes organised, and causes *anchylosis*. But if the disease advance, ulceration spreads to the bones, which can be heard to grate on the least motion;—the joint, long bent by the flexor muscles, becomes dislocated by their continued action, owing to the destruction of the ligaments;—suppuration occurs in the joint, numerous tortuous abscesses form around it;—and the patient dies hectic. *Causes.*—Cold, or neglected injury; but it is more frequently idiopathic in constitutions disposed to scrofula;—it is most common between puberty and thirty-five.

DISEASE OF THE HIP-JOINT generally consists of primary ulceration of the cartilages. There are two points connected with it that require notice. (1.) In the early stages the pain is much more frequently and severely felt at a part remote from the hip (and especially at the knee) than at the hip itself. Moreover, this pain of the knee may be accompanied with slight tenderness and swelling. But if the surgeon make pressure behind the great trochan-

ter, or in the groin; or if he press the head of the femur against the acetabulum;—he will produce pain of the hip, and aggravate the pain of the knee;—although the latter joint may not be in the least disturbed by the examination. (2.) The limb undergoes a remarkable change of length in the progress of the disease. In the first stage it appears to be lengthened an inch or two;—subsequently it *appears to be* shortened;—and finally it becomes *really* shortened, owing to ulceration of the acetabulum and ligaments, which permit the muscles to dislocate the head of the bone, and lodge it on the dorsum ilii. The lengthening in the early stage is apparent and not real; for the distance from the shoulder or crest of the ilium to the ankle is the same on both sides. It has been explained by supposing, that when the patient stands, he rests his weight entirely on the sound limb—that he uses the other merely to balance himself, and for that purpose stretches it out rather in front;—and that, in consequence, the pelvis on the diseased side becomes habitually depressed. Mr. Wickham shows, however, that this explanation is not correct. He clearly proves, that in the first stage of the disease there is a spasmodic action of the glutæ and rotator muscles; in consequence of which the affected limb is drawn away a little from the median line. In comparing their lengths, the surgeon naturally approximates the sound limb to the diseased one; and as the sound one seems to lose a little of its length by being made to pass the median line—so the diseased one is, by comparison, *apparently lengthened.* Mr. Wickham also shows that, after a time, the glutæi muscles waste, and the nates become flattened;—and that then there is an *apparent shortening;* —caused by a preponderating action of the psoas and iliacus, which draw the thigh forwards over the other limb. But this shortening is quite distinct from the real dislocation, which occurs in the last stage, and in which the limb is shortened two or three inches, and the foot turned outwards, as in fracture of the cervix femoris. The prognosis in hip disease is very unfavourable for adults, if abscesses have begun to form. Children, however, may recover from this stage.

Treatment.—The remedies for ulceration of cartilage are, 1. *Perfect rest.* 2. Counter-irritation, especially by setons or caustic issues. If the joint affected be the hip, a seton may be passed through the skin of the groin; or a caustic issue may be made behind the great trochanter. For the knee, a seton or issue may be established on each side of the head of the tibia. It is better to keep open an issue by rubbing it occasionally with the potass, than to use peas;—and it is better to keep open a blister by savine ointment, than to apply a succession. 3. Local bleeding is of service to relieve occasional aggravations of pain. When abscesses form, they should be opened precisely in the manner directed for *large chronic abscess;* (p. 61;) but they should by no means be opened too early.

SECTION V.—ARTICULAR CARIES.

Caries of the head of a bone is not an uncommon cause of ulceration of the adjacent cartilage and disorganisation of the joint. It may spread from the shaft of the bone, or may originate in the extremity. The affected bone is found soft, red, and vascular; its cancelli are filled with a reddish fluid, and in scrofulous cases a cheesy matter is deposited in them. Owing to this softened state of the bone, the cartilage peels off it readily. An advanced stage of this disease gives rise to what was formerly called *spina ventosa*;—that is, the extremity of the bone becomes greatly enlarged, but is hollowed out into a mere shell by suppuration in its interior. The *symptoms* are nearly the same as those of ulceration of cartilage;—fixed pain, extending to distant parts of the limb;—aggravated by motion, and unaccompanied at first by swelling. In scrofulous cases there is a remarkable absence of pain, except during the formation and bursting of abscesses. *Treatment.*—Rest, occasional local bleeding; and issues.

Diagnosis.—The distinguishing features of the three principal diseases of joints may be thus summed up. In the inflammation of the synovial membrane, swelling occurs early;—it fluctuates freely; and causes the form of the joint to be altered. The pain in the chronic form is not *immediately* aggravated by motion, or by pressure of the bones against each other. In ulceration of the cartilages, the swelling does not come on till weeks or months after the pain;—and it has the form of the joint, because it depends on a slight equable infiltration of the surrounding tissues. The pain is much more severe;—it is often felt at a remote part, and is invariably aggravated by pressure or friction. In caries of the bone the pain is less severe, especially in children; and swelling is rather more early than in ulceration of the cartilage. Mr. Wickham has shown that in affections of bone generally, there is a disposition to erysipelas of the superjacent skin; and he thinks that this may often be a criterion of articular caries. On this account issues are to be preferred to setons in the treatment of the last-named affection;—because they are much less liable to irritate the skin.*

Anchylosis, or immobility, is a frequent consequence of articular disease. There are three kinds. 1. The *spurious*, depending on thickening and deposits into the ligaments, and rigidity of the muscles. To be treated by friction, warm and vapour baths, and other means to excite absorption, and frequent passive motion;—suffi-

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* Wickham's Treatise on Diseases of the Joints—a work containing much that is original in pathology, and valuable in practice.

cient to cause a little yielding, but not too forcible. 2. *Soft anchylosis* consists in union of the ends of the bones by ligament. Motion may be restored to a great extent by frequent flexion, aided by mechanical means. 3. *Hard anchylosis* is produced when, after ulceration of cartilage, the lymph effused ossifies. It is incurable.

SECTION VI.—WOUNDS OF JOINTS.

SYMPTOMS.—A wound may often (but not invariably) be known to have penetrated a joint, by the escape of synovia, in the form of small oily globules.

TREATMENT.—The object is to avert acute inflammation of the synovial membrane, which might prove fatal. If, therefore, the part wounded be the knee,—and if the skin be torn or injured so that the wound cannot be closed, or so that it is certain not to unite by adhesion, and if the patient's constitution be bad, amputation should be performed at once. Otherwise, the wound should be carefully closed with a piece of lint dipped in blood;—the joint should be kept quite motionless on a splint;—and every local and constitutional measure be adopted, to avert or subdue inflammation. It is a general rule, that in every case of injury or disease, which is likely to render a joint stiff, it should be placed in such a position as will render it most serviceable afterwards. The knee slightly bent;—the elbow at a right angle;—the wrist straight;—the ankle so that the foot may be at right angles to the leg.

SECTION VII.—OF DISLOCATION GENERALLY.

SYMPTOMS.—The symptoms of dislocation are two;—(1.) *Deformity;* there being an alteration in the form of the joint;—an unnatural prominence at one part and depression at another, together with lengthening or shortening of the limb. (2.) Alteration of the mobility of the joint;—which is most frequently diminished or abolished.

CAUSES.—Dislocation may be caused by mechanical violence;—or by muscular action;—and the circumstances that enable muscular action to produce it are,—a peculiar position, (as when the jaw is very much depressed);—paralysis of an antagonist set of muscles;—elongation of ligaments;—or fracture or ulceration of some process of bone.

MORBID ANATOMY.—Dislocation is generally attended with rupture of ligaments, which may readily unite and heal by the adhesive inflammation. If the dislocation be left unreduced, the lymph thrown out around the head of the bone becomes converted into new socket and ligaments, and a very useful degree of mo-

tion is often acquired. Meanwhile the old socket gradually becomes filled up.

DIAGNOSIS.—Dislocation may be distinguished from fracture, 1, by the *absence of crepitus*. For although a slight *crackling* is often perceivable, owing to an effusion of serum into the cellular tissue, it can hardly be mistaken for the *grating* of fracture. 2. By the circumstance that mobility is *increased in fracture, diminished in dislocation*. 3. By *measurement* of the bone supposed to be broken. 4. By the *patient's age*;—for fractures near joints are most common in the young, dislocations in the adult.

TREATMENT.—1. It will be necessary, before attempting reduction, to diminish the resistance offered by the muscles, if those which surround the affected joint be large, or if the patient be robust and plethoric. Bleeding to faintness; immersion in a hot-bath (100 to 108 F.) for half an hour, and the exhibition of half-grain doses of tartar emetic, are the requisite measures. But they may be often avoided if the reduction can be effected before the patient has recovered from the faintness consequent on the injury. 2. The part from which the bone was dislodged must be fixed. 3. The dislocated limb must be extended in such a manner as to draw the head of the bone into its socket, and in such a position as to relax as many of the opposing muscles as possible. After reduction, leeches, cold, and purging must be used to prevent inflammation, and the joint should be kept at rest till any laceration of its ligaments may have healed, otherwise the dislocation may be perpetually recurrring.

COMPOUND DISLOCATION is a dangerous accident, because of the acute synovial inflammation, rapid ulceration of cartilage, and violent constitutional disturbance with which it is liable to be followed. The necessity of amputation will depend on precisely the same contingencies as in compound fracture;—old age;—bad constitution;—shattering of the bone;—extensive bruising or laceration of the integuments, so that the wound cannot be closed;—laceration of large blood-vessels;—or if it be the knee joint. If the limb is to be saved, the dislocation must be reduced;—if the end of the bone protrude through the skin, and render reduction difficult, it must be sawed off, or the aperture must be slightly dilated;—the wound must then be closed, and covered with a piece of lint dipped in blood;—and perfect rest observed.

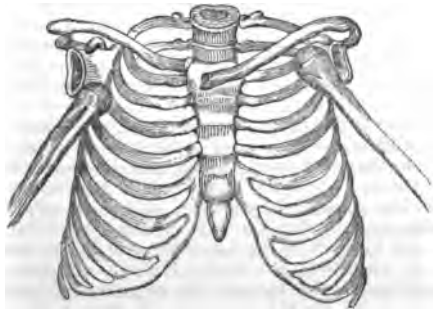
SECTION VIII.—OF PARTICULAR DISLOCATIONS.

DISLOCATION OF THE JAW may be caused by a blow on the chin, when the mouth is wide open, or by spasm of the pterygoid muscles, so as to draw the articular condyles over the transverse root of the zygomatic process. *Symptoms.*—The mouth fixedly open;—the chin protruding forwards;—and a prominence felt under the zygomatic process. If the dislocation affect one side only, the

chin will be turned towards the opposite. *Treatment.*—The surgeon should wrap a napkin around his thumbs, and place them at the roots of the coronoid processes behind the molar teeth;—then he should press them downwards and backwards, elevating the chin at the same time with his fingers. Or he may place the handle of a fork on the last molar teeth, and depress them with it, using the upper teeth as a fulcrum. Or a piece of cork may be put between the molar teeth in order to act as a fulcrum, whilst the chin is elevated. After reduction, the chin must be confined for a week or two by a *four-tailed bandage.*

DISLOCATIONS OF THE CLAVICLE.—The *sternal extremity* of this bone may be dislocated *forwards* by blows on the shoulder. It can readily be felt on the anterior surface of the sternum. The *treatment* is in all respects the same as for fractured clavicle. Dislocation of this end of the bone *backwards* has been caused by curvature of the spine. It has produced so much pressure on the œsophagus as to threaten starvation, and in consequence has been extirpated by Mr. Davie of Bungay.

The *outer extremity* of the clavicle may be dislocated *upwards* on the acromion. The shoulder is sunken and flattened; and, on tracing the spine of the scapula, the end of the clavicle can be felt upon the acromion. *Treatment.*—Same as for fractured clavicle.



DISLOCATIONS OF THE SHOULDER JOINT may occur in four directions. (I.) In the dislocation *downwards*, or *into the axilla*, which is the most common, the head of the bone rests on the axillary plexus of nerves, between the subscapularis muscles and the ribs. *Symptoms.*—The arm is lengthened;—a hollow may be felt under the acromion;—the shoulder seems flattened;—the elbow sticks out from the side;—and the head of the bone can be felt in the axilla if the limb be raised;—although such an attempt causes great pain and numbness. *Diagnosis.*—There are three fractures

liable to be mistaken for this dislocation; viz. fracture of the *acromion*;—of the *neck of the scapula*;—and of the *neck of the humerus*. The two first may be known by the facility with which the form of the joint is restored by raising the limb, and by the crepitus felt on doing so. In fracture of the *cervix humeri*, the limb is *shortened*;—there is not so much vacuity under the acromion;—and the rough angular end of the shaft may be felt in the axilla.

2. In the dislocation *forwards*, the head of the humerus may be felt under the clavicle. The arm is shortened;—the elbow projects backwards;—the acromion seems pointed, and the head of the bone cannot be felt under it.

3. In the dislocation *backwards*, the head of the bone may be felt on the dorsum scapulæ;—and the elbow projects forwards.

4. The head of the bone may be *partially dislocated*, being thrown partly off the glenoid cavity against the coracoid process.

TREATMENT.—(1.) The dislocation downwards may be reduced by *simple extension*. A jack-towel is to be passed round the chest, both above and below the shoulder, so as to fix the scapula well; this should be held firmly. Another should be fastened round the arm, above the elbow. Extension should then be made by the latter;—the patient sitting on the floor, his elbow being bent, and the humerus raised and carried forwards, so as to relax the deltoid, supra-spinatus, and biceps muscles. When extension has been made for some minutes, the surgeon should lift the head of the bone, and it will frequently return with a snap. (2.) Or the extension may be performed by the *pulleys*;—recollecting always that they are not to be used in order to exert *greater force*, but to exert it *more equably*. (3.) Or the reduction may be performed by the *heel in the axilla*. The patient lies down on a bed, and the surgeon sits at the edge. He puts his heel (without his foot) into the axilla, to press the head of the bone upwards and outwards, and at the same time pulls the limb downwards by means of a towel fastened round the elbow. (4.) In *Malgaigne's method*, the patient lies down;—the scapula is well fixed, by placing one hand or foot upon the shoulder, or by passing a jack-towel over the shoulder, and fixing it to the opposite corner of the bed;—then the elbow is raised from the side, and drawn straight up by the head, till the bone is thus elevated into its socket. (5.) Or, lastly, the patient may be seated in a chair;—the surgeon places one of his *knees in the axilla*, resting the foot on the chair. He then puts one hand on the shoulder, to fix the scapula, and with the other depresses the elbow over his knee.

The dislocation *forwards*, and the *partial dislocation*, may be reduced by the *heel in the axilla*, or by *extension* with the pulleys or otherwise. The extension must be made in a direction downwards and backwards. For the dislocation backwards, extension should be made forwards.

DISLOCATIONS OF THE ELBOW.—(1.) When *both radius and ulna*

are dislocated *backwards*, the elbow is bent at a right angle and immovable. The olecranon projects much behind;—a hollow can be felt at each side of it, corresponding to the greater sigmoid cavity;—and the trochlea of the humerus forms a hard protuberance in front. The coronoid process rests in that fossa of the humerus which naturally contains the olecranon.

(2.) In dislocation of *both bones backwards and outwards*, the coronoid process is thrown behind the external condyle; and in addition to the preceding symptoms, the head of the radius can be very plainly felt on the outer side of the joint.

(3.) The dislocation *backwards and inwards* is known by a great projection of the outer condyle, in addition to the symptoms of the first variety.

(4.) In *dislocation backwards* of the *ulna solely*, the olecranon is much projected backwards;—the elbow is immovably bent at right angles, and the fore arm is much twisted and pronated.

The *treatment* of these four varieties is the same. Reduction may be effected, (1) by fixing the lower end of the humerus, whilst the fore arm is drawn forwards; (2) or the surgeon may bend the elbow forcibly over his knee; (3) or (if the case be quite recent) he may forcibly straighten the arm, so as to make the tendon of the biceps pull the *trochlea* of the humerus back into its place.

5. The head of the *radius alone* may be *dislocated forwards*, being thrown against the external condyle. The hand is prone; the elbow slightly bent, and in bending it more, the head of the radius can be felt to strike against the front of the humerus. *Treatment.*—Simple extension from the hand, the elbow being straight.

6. Dislocation of the *radius backwards* is very rare. The head of the bone can be felt behind the outer condyle. *Reduced* by simply bending the arm, which should be kept bent for three weeks.

Diagnosis.—These dislocations of the elbow may be readily distinguished from fractures, (1) by the impaired mobility and absence of crepitus; (2) by measuring the length of the humerus from its condyles to the shoulder;—which will be equal to that of the sound limb in dislocation, but diminished in fracture of the lower extremity of the humerus.

Dislocation of the Wrist may readily be distinguished by the altered position of the hand, which is thrown either backwards or forwards if both bones be dislocated, and twisted if one only be displaced,—and by the alteration of the natural relative position of the styloid processes of the radius and ulna with the bones of the carpus. They are reduced by simple extension.

Dislocations of the Hand.—The *os magnum* and *os cuneiforme* are sometimes partially dislocated through relaxation of their ligaments, and form projections at the back of the hand, which

must not be mistaken for ganglia. *Treatment.*—Cold affusion, friction, and mechanical support.

Dislocations of the *thumb*, *fingers*, and *toes*, are difficult of reduction in consequence of the strength and tightness of their lateral ligaments, and the small size of the part from which extension can be made. A firm hold may be obtained by means of a piece of

tape fastened with the knot called the *clove hitch*. Extension should be made towards the palm, so as to relax the flexor muscles.

Dislocations of the Ribs.—The costal cartilages may be torn from the extremity of the ribs, or from the sternum;—and the posterior extremity of the ribs may be dislocated from the spine by falls on the back; but these accidents are very rare. Any displacement must be rectified if possible, and the same local and constitutional treatment be adopted that was prescribed for fracture.

Dislocations of the Hip-joint may occur in four directions;—besides two others that are exceedingly rare.

1. Dislocation *upwards on the dorsum ilii* is the most frequent. *Symptoms.*—The limb is from an inch and a half to two inches and a half shorter than the other;—the toes rest on the opposite instep;—the knee is turned inwards, and is a little advanced

upon the other;—the limb can be slightly bent across the other, but cannot be moved outwards;—the trochanter is less prominent than the other, and nearer the spine of the ilium;—if the patient be thin, and there be no swelling, the head of the bone can be felt in its new situation.

Diagnosis.—Fracture of the *cervix femoris* may be distinguished from this dislocation by the greater *mobility*, and by the limb being *turned outwards*, and by *extension*, which restores it to its proper length. *Treatment.*—In the first place, it will be requisite to diminish the force of the muscles by means that have been already mentioned. Then the patient being placed on his back, his pelvis should be fixed by a strong girth or towel passed between the pudendum and thigh, and fixed to a wall or post. A linen roller should be applied to the lower part of the thigh, and over it the strap belonging to the pulleys;—which last are to be fixed to the wall or some other firm object. Then extension is to be made in such a direction as *to draw the thigh across the opposite, a little above the knee.* After a little time, the surgeon should gently rotate the limb, or lift the upper part of it, and the head of the bone will probably return to the acetabulum. The patient should then be carefully moved to bed with his thighs tied together.

2. The dislocation *backwards* (*into the sciatic notch*, or on the *pyriformis*) is thus known. The limb is shortened from half an inch to an inch;—the toes rest on the ball of the great toe of the other foot;—the knee is advanced and turned inwards, but not so much as in the last case;—the trochanter is rather behind its natural position, and the head of the bone can scarcely be felt. *Treatment.*—Pulleys are required, as in the last case; but the patient should be placed on his side, and the limb be drawn across the middle of the opposite thigh. After a little while the upper part of the limb should be lifted by means of a napkin, so as to raise the head of the bone over the edge of the acetabulum.

3. In the dislocation *downwards*, (into the *thyroid foramen*, or on the *obturator externus*,) the limb is lengthened one or two inches;—it is drawn away from the other;—the toes point downwards and directly forwards;—and the body is bent forwards, because the psoas is on the stretch. *Treatment.*—The object is to draw the head of the bone outwards, and rather upwards. (1.) The patient may be laid on his back, with a bedpost between his thigh, and close up to the fork. Then the foot may be carried inwards, across the median line;—so that the bedpost, acting as a fulcrum, may throw the head of the femur outwards. But the foot must not be *raised*, otherwise the head of the femur may slip round under the acetabulum into the sciatic notch. (2.) Or the pelvis may be fixed by straps, and the pulleys be applied to the upper part of the thigh, to draw it outwards; the knee being at the same time pulled downwards and inwards.

4. In the dislocation *upwards and forwards*, (on the pubes,) the limb is shortened about an inch;—it is drawn away from the other, and the foot points directly outwards; the head of the bone may be plainly felt below Poupart's ligament;—and by this circumstance this dislocation may be distinguished from fracture of the cervix femoris. *Treatment.*—The patient is to be laid on the sound side;—extension should be made with the pulleys in a direction backwards and outwards;—and after it has been continued a little time, the head of the bone should be lifted over the edge of the acetabulum by means of a napkin.

Besides these, a dislocation directly upwards, and one directly downwards, have been known to occur, although very rarely. They may be distinguished by an atten-

tive examination of the deformity that is present, and by the absence of any symptoms of fracture.*

DISLOCATIONS OF THE KNEE.—Dislocation of the *tibia from the femur* is not very common; and when it does occur is rarely complete. In most cases the tibia is thrown backwards into the ham. The deformity and impediment to motion will enable the practitioner to distinguish the accident;—and if there be no complication requiring amputation, the displacement must be rectified by simple extension, and the knee be kept at rest for three weeks.

Dislocation of the patella may occur either inwards or outwards; more frequently the latter. The knee cannot be bent, and the bone can be felt in its new situation. *Reduction* may be performed without difficulty by means of the finger and thumb, the knee being straight and the leg raised. A case is recorded, however, in which the patella was turned round, so that its inner edge rested on the outside of the trochlea of the femur, and its outer edge was immediately under the skin. The surgeon was unable to reduce it by any means, even although he divided the extensor tendon; and the patient died in eleven months in consequence of his wounding the joint. Mr. Mayo relates a similar case, in which he succeeded in overcoming the difficulty by bending the knee to the utmost, so that the patella was drawn down out of the groove in which it was lodged.

DISLOCATIONS OF THE ANKLE.—Dislocation of the *tibia inwards* is the most common. It is attended with fracture of the lower third of the fibula, and may be known by the sole of the foot turning outwards;—the inner edge turning downwards;—and great projection of the internal malleolus. Dislocation of the *tibia and fibula outwards* is attended with fracture of the internal malleolus, and may be known by the sole of the foot turning inwards. In dislocation *forwards*, the foot appears shortened, and the heel lengthened;—in dislocation *backwards*, the reverse. *Treatment.*—The patient must be laid on the affected side, with the knee bent, (to relax the gastrocnemius,) and held by an assistant. The surgeon must then grasp the instep with one hand, and the heel with the other, and make extension, (aided by pressure on the end of the tibia,) till he has restored the natural shape and mobility of the parts. Then the limb must be *put up* in the same manner as a fracture of the leg, taking care to keep the great toe in its proper line with the patella.

Compound dislocation of the ankle must be treated according to the rules laid down for the general treatment of compound dislocation. The necessity of amputation must also be estimated by the same rules. If the end of the tibia protrude, and its reduction

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* Vide a paper on Rare Dislocations of the Hip-joint, in the Med. Chir. Trans. vol. xxi., by Mr. Travers jun.

be difficult, or if it be fractured obliquely, it had better be sawn off. This measure, by shortening the limb, diminishes muscular spasm, and prevents the constitutional irritation arising from ulceration of the cartilage.

DISLOCATIONS OF THE FOOT.—The *astragalus* is sometimes dislocated; and if it remain unreduced, great deformity must ensue. Pressure and extension will mostly succeed in reducing this as well as dislocation of the internal cuneiform bone;—or of the anterior row of tarsal bones from the posterior, which sometimes happens. The astragalus has been completely dislocated from between the tibia and os calcis, and has sloughed away, or been dissected out by the surgeon, leaving the foot tolerably useful.

CHAPTER VII.

OF INJURIES AND DISEASES OF ARTERIES.

SECTION I.—OF WOUNDS OF ARTERIES, AND THE GENERAL TREATMENT OF HÆMORRHAGE.

SYMPTOMS.—An artery may be known to be wounded by the flow of blood;—which is profuse;—of a florid colour,—and ejected *per saltum*.

PATHOLOGY.—The *means which nature employs* for the *suppression of arterial hæmorrhage* are, 1st and principally, *contraction* of the divided orifice; 2ndly, *retraction* of the artery into its sheath; 3rdly, *coagulation* of the blood in the sheath, and in the course of the wound, thus obstructing the further exit of blood; 4thly, the *faintness* induced by hæmorrhage;—which gives the blood a greater tendency to coagulate, and checks the circulation.

If the wounded artery be *very large*, (as the femoral,) and the flow of blood be in no manner opposed, death may occur almost instantaneously. If it be of the *second order*, (as the humeral or tibial,) the bleeding may temporarily cease, but will most likely return at intervals, if induced by any excitement of the circulation;—and thus the patient may die of repeated hæmorrhage, unless it be checked by art, or by the natural process of reparation to be presently mentioned. If the artery be *smaller*, (as the digital,) hæmorrhage, although pretty brisk for a time, soon ceases spontaneously and permanently.

If the artery has been *completely cut across*, the adhesive inflammation is set up;—the contracted orifice of the vessel is plugged

with a yellowish green lymph;—that part of it which intervenes between the wound and the nearest branch, gradually contracts in the shape of the neck of a champagne bottle;—the blood coagulates within it, adheres to its internal surface, and (provided this process is not interrupted by further bleeding) becomes organised into a cellulo-fibrous tissue;—and, finally, the impervious portion of the artery degenerates into a fibrous cord, and is gradually absorbed.

A *puncture, or partial division*, of an artery, is much more dangerous than a complete division;—evidently because it hinders the *contraction*, the principal natural means of arresting hæmorrhage;—which in this case is only obstructed by the coagulated blood in the wound. (1) The aperture, if longitudinal or very small, may in favourable cases be closed by the adhesive inflammation, the artery remaining pervious. The uniting lymph, however, is very liable to be dilated into a *false aneurism*. (2) Or the channel of the artery may be obliterated by lymph or coagulated blood. (3) Or bleeding may recur perpetually, till the undivided part of the vessel ulcerates, or is divided by art.

When an artery is *torn across*, it contracts almost immediately; so that an arm or leg may be carried off by a shot or by machinery, without any loss of blood from the axillary or tibial arteries.

TREATMENT.—The first indication is to stop the flow of blood, until measures can be adopted for arresting it permanently. This may be done by placing a finger on the orifice of the bleeding vessel, or by grasping it between the finger and thumb;—or by making pressure on the wound itself;—or by pressing the trunk of the artery above against a bone;— or the *tourniquet* may be applied; or in default of that, a handkerchief may be passed round the limb, and be twisted tightly with a stick. The *permanent measures* are, ligature—torsion—pressure—cold, and styptics.

I. LIGATURE.—When a ligature is tied tightly upon an artery, it divides the middle and internal coats, leaving the external or cellular coat enclosed in the knot. Then the cut edges of the internal coats unite by adhesion;—the blood between the point tied and the nearest collateral branch, coagulates and adheres to the lining membrane;—the ring of the cellular coat enclosed in the ligature, ulcerates;—and the ligature comes away in from five to twenty-one days, (sooner or later, according to the size of the vessel;) and, finally, that portion of the artery which is rendered impervious, shrinks into a fibrous cord. The efficacy of the ligature depends on two things. (1st) On the *adhesion of the cut surfaces* of the internal coats of the artery;—and in order to promote this, the *ligature should be small and round, (dentists' silk* is the best material,) so as to divide them smoothly and evenly.* (2ndly)

* J. F. D. Jones, M.D. Treatise on Hæmorrhage and the Ligature. Lond. 1805.

On the *adhesion* and *organisation of the blood* in the artery between the part tied and the nearest branch. Now, although the adhesion of the internal coats alone *may* be sufficient to prevent bleeding, still it must be recollected that the place of this adhesion is close to the ligature;—that the ligature is necessarily removed by ulceration of the cellular coat;—that this ulceration is attended with suppuration;—that owing to this suppuration the adhesion might be broken up,* and that consequently it will be expedient that the coagulum be long, and that its adhesion to the artery be as firm as possible. Hence the important rule, *never to tie an artery immediately below a branch;*—and in tying it, to *disturb it as little as possible;*—in order not to tear through the vessels which it receives from its sheath, and on which the nutrition of its coats, and their capacity for adhesion, depend. If the artery be *completely divided*, each end should be tied. They should, if possible, be first drawn out a little with a common (or Assalini's) forceps, so that nothing may be tied but the artery;—if that cannot be done, the bleeding orifice must be transfixed with the *tenaculum;*—but in some cases, where it is deeply seated or cannot be found, it is necessary to pass a curved *needle and ligature* through a considerable thickness of the flesh, and tie it altogether. After tying, one end of the ligature should be cut off, and the other be made to hang out of the wound. If the artery be *wounded merely*, a ligature should be placed *both above and below the orifice;* and the intermediate part may or may not be cut through. When the wound is not large enough to expose the artery, it should be lengthened by an incision upwards and downwards; and it is better, as Mr. Guthrie insists, to cut even through thick muscles, than to tie the trunk of the artery above the wound.† When the artery is diseased and brittle, the ligature should be large, and not tied so tightly,—otherwise it may cut through entirely.

II. Torsion is performed by drawing out the vessel, fixing it by a pair of forceps a quarter of an inch from the end, and then twisting the end round and round till it will not untwist itself. There is no English authority for applying this method to large arteries. A *pinch with the forceps* will often cause small vessels to cease bleeding. There are certain methods of obliterating arteries, which act by causing effusion of lymph on their inner surface, and coagulation of blood in them:—such as applying a ligature for a few hours, and then removing it;—or passing needles through them;—but these are not to be depended on.

III. Pressure is applicable to wounded arteries situated imme-

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* Manec says it is always so. On the Ligature of Arteries, translated by Garlick and Copperthwaite. Halifax, 1832.

† Guthrie on Diseases and Injuries of Arteries, p. 254. Lond. 1830.

diately over bones; as the temporal;—or to arteries that lie very deeply; as the external carotid in the parotid gland;—or to arteries that are so diseased that a ligature will not hold. The pressure must be confined as much as possible to the bleeding orifice, and should be effected by a *graduated compress; i. e.* one composed of several pieces gradually decreasing in size, the smallest being on the wound. It is a good plan to apply pressure to the course of the trunk, above the wound; and to envelope the whole limb in a bandage. When the palmar arch is wounded, one compress may be placed on the wound, and another on the back of the hand;—a paper knife or strong slip of wood may then be laid on each compress transversely across the hand, and their ends be firmly tied together.

IV. COLD is applicable to cases of bleeding from numerous small vessels. If there is a general oozing from a stump after amputation, a cloth dipped in cold water may be twisted over the face of it. *Exposure to cold air* will sometimes suffice to check hæmorrhages from the vagina and rectum.

V. STYPTICS may check hæmorrhage, 1, by opposing a mechanical obstacle to the exit of blood;—as the *agaric*, and other porous substances which entangle it;—2, by coagulating the blood;—3, by causing contraction of the bleeding vessels;—4, by exciting the adhesive inflammation and formation of granulations. The tinc. ferri mur.; a saturated solution of alum;—turpentine, and nitrate of silver, are the best. They are applicable to the same cases as cold;—and may sometimes be used as aids to pressure. The *actual cautery*, if the iron be *red hot*, stops bleeding mechanically by burning up the orifices of the vessels, but it is liable to return when the eschar separates. It is better to use the iron at a *black heat*, for then it excites the adhesive inflammation, and is very efficacious for arteries that either cannot be tied, or are too diseased to hold the ligature.

SECONDARY HÆMORRHAGE may occur under many circumstances. 1. It often happens that in a few hours after a wound has been bound up, and the patient put to bed, sundry arteries bleed that would not have done so if exposed to cold. The wound must be opened; any vessels must be tied that require it;—the surface should be sponged with cold water, and then be exposed to the air for a few hours. 2. There may be a *general exudation* of blood subsequently, owing to some disorder of the circulation. Its *causes* are described in the chapter on Gunshot Wounds at p. 104, and the *treatment* at p. 107. 3. Hæmorrhage may occur from *sloughing* of an artery, as also mentioned at page 103. 4. From *ulceration* spreading through the arterial tunics. 5. It may occur from imperfect closure of an artery when a ligature separates. This may be owing to some disease of the vessel, which renders it prone to ulceration;—or to a coarse, thick, ill-applied ligature that has bruised the internal coats instead of cutting them evenly;—or to a

disturbance of the artery in its sheath. In the three last cases the only remedy is to cut down upon and tie the bleeding orifice;—or if that cannot be done, or the vessel be too diseased to hold the ligature, and pressure and styptics fail, the trunk must be tied above. 6. Hæmorrhage is apt to come from the lower orifice of a divided artery, if only the upper one has been tied. The blood *wells* out in a continuous stream, but not with the arterial *saltus*;—and it is not quite so florid as that which comes from the other end. 7. Hæmorrhage is likely to occur from either orifice, if the operation for *aneurism* is applied to a wound of an artery;—that is, if the trunk at a distance be tied instead of the wounded parts.*

THE HÆMORRHAGIC DIATHESIS is a peculiar constitutional defect, which seems to consist in deficient contractility of the arteries. The slightest wound bleeds almost uncontrollably, and life may be lost through the most ordinary surgical operation. If the existence of this diathesis be ascertained, surgeons would do well to refrain from operations on the individual possessing it.

SECTION II.—OF INFLAMMATION OF ARTERIES.†

1. *Subacute Arteritis* (*Phlegmonous Arteritis*, Guthrie) is a local form of inflammation, not extending any great distance. It produces redness and thickening of the artery, with effusion of lymph into its cavity, and coagulation of the blood within it. The *symptoms* are tenderness of the affected artery, with violent pain, numbness, absence of arterial pulsation, and tendency to gangrene, in the parts supplied by it. *Treated* by local and general antiphlogistic measures;—taking care to support the circulation of any part that threatens to slough.

2. *Acute Arteritis* (*Erysipelous Arteritis*, Guthrie) has a tendency to spread, and involve the arterial system generally, and to produce rapid suppuration. It may be idiopathic, or may be *caused by a wound*. It is known by very violent fever, and great throbbing of the arteries; succeeded by symptoms of *irritative fever*; with livid vesications on different parts of the body. If the disease originate in a wound, there will probably be gangrene. *Treatment* must be antiphlogistic, without reducing the patient too low.

3 *Chronic Arteritis* may be supposed to be one cause of thickening, softening, and ossification of arteries.

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* Guthrie, op. cit. p. 248.

† Guthrie, op. cit. Mayo, Pathol., p. 447. Copland, Dict., art. Arteries.

SECTION III.—OF ANEURISM.

DEFINITION.—A sac filled with blood, and communicating with an artery, by the rupture or dilatation of which it has been produced.

VARIETIES.—1. The *true aneurism* consists of a dilatation of all the arterial coats, for a part only of their circumference. 2. The *general dilatation* consists of a bulbous expansion of all the arterial tunics for the whole of their circumference. It differs from true aneurism in containing no *laminated coagula*. 3. *False aneurism* is caused by a rupture of the middle and internal coats, and dilatation of the outer one alone. 4. In the *sacculated* aneurism some parts dilate faster than others. 5. The *mixed false aneurism* consists of a false aneurism, formed by rupture of part of the coats of a true one;—there being two tumors, one growing from the other. 6. The *dissecting aneurism* is one in which the blood finds its way between the arterial tunics, and may even open into the artery at another part. 7. *Diffused aneurism* is one whose sac is formed by none of the arterial tunics. (*a*) It may be formed of lymph;—owing to a wound of the vessel, the cicatrix of which yields to the blood. (*b*) Or the sac may be composed of cellular tissue, into which blood has escaped when an artery has been wounded without a corresponding wound of the skin;—or when the latter has healed.

PATHOLOGY.—The formation of a true aneurism is preceded by thickening, and deposit of an opake curdy matter at some spot in the circumference of the artery. This spot gradually dilates, and forms a sac, which communicates with the artery by a distinct rounded opening. It very soon becomes lined with coagulated blood, deposited in successive regular layers;—of which those first deposited become pale and firm. At first the arterial tunics may be traced completely over the aneurism;—but as the latter increases, the two inner coats become extremely thin, and at last are ruptured or absorbed. *False aneurism* may commence by a laceration of the internal and middle coats, when rendered brittle by earthy or steatomatous deposits between them;—or sometimes small cysts are formed between the coats of an artery, and are converted into aneurisms by the blood forcing a passage into them.

SYMPTOMS.—If an aneurism be seated in the neck or limbs, it appears as a tumor in the course of an artery, and pulsating with it. If it be small and not filled with coagulum, pressure on the artery above will render it flaccid, so that it may be emptied by pressure;—and the blood returns into it afterwards with a peculiar vibratory thrill or *bruissement*. The patient will very often say that it commenced after some violent strain, when something appeared to give way. In the chest, aneurism will be principally known by an unnatural pulsation felt by the patient, and detect-

able by the stethoscope ;—together with symptoms of disordered circulation and respiration. In the abdomen, an aneurismal tumor may be felt through the parietes.

Diagnosis.—Tumors situated over arteries, and receiving pulsation from them, may be distinguished from aneurism by noticing, 1st, that they do not pulsate at first, when they are small ;—whereas aneurisms do so from their earliest formation. 2ndly, That a tumor may often be lifted up from the artery, and that then it will cease to pulsate. 3rdly, That aneurisms are generally soft at first, and become hard subsequently ;—tumors are generally the reverse. 4thly, That tumors *cannot be emptied by pressure* ;—and that no alteration is made in their consistence by compressing the artery above. 5thly, *Enlarged lobes of the thyroid gland* may be distinguished from aneurism of the carotid by their slipping up out of the fingers, along with the larynx in the act of deglutition. 6thly, *Psoas abscess* may be known from aneurism by the precursory pain and weakness in the back ; and by its disappearance when the patient lies down.

Progress.—As an aneurism enlarges, its coats become thinner, but are strengthened by the adhesion of the parts around. As the enlargement proceeds, these are gradually absorbed ;—bone offers no resistance, but is absorbed as well ;—cartilage (especially the intervertebral) is, from its elasticity, longer in yielding ;—but at last the tumor reaches the skin and distends it. Inflammation succeeds ;—the skin becomes red, then livid and vesicated ;—and sloughs. When the slough separates, a fatal bleeding ensues ;—sometimes in a gush enough to destroy life at once, although more frequently the blood oozes away slowly. But an aneurism may burst into a mucous canal ;—or into a serous cavity ; (although then the aperture is formed by a laceration, and not by sloughing)—or into a vein, with, of course, a fatal disturbance of the circulation if the vein be large ;—or it may cause death by pressure on the trachea or œsophagus, without bursting.

Spontaneous Cure.—In some fortunate cases a spontaneous cure occurs. 1st, It may occur in consequence of the coagulation of the blood contained in the sac, and the conversion of the aneurism into a firm tumor. In some cases, however, the sac does not become quite obliterated, but the coagula become thick and firm enough to resist further distension. Nature generally endeavours to aid this process by enlarging the collateral circulation, and by setting up the adhesive inflammation so as to thicken the artery and obstruct its current. It has happened that a portion of clot has been detached from the interior of the sac by some accidental violence, and has effected a cure by blocking up the opening into the aneurism. 2ndly, The aneurism has sometimes sloughed, or has been involved in a large abscess ; and the artery participating in the inflammation has become obstructed by effusion of lymph, or by coagulation of the blood in it. 3rdly, The artery has be-

come obliterated by an accidental pressure of the aneurism upon it;—or by the pressure of blood escaping from it on its bursting into the cellular tissue, as sometimes happens.

CAUSES.—The *predisposing* cause of aneurism is some constitutional tendency to arterial disease. The *exciting cause* may be, strong emotion of the mind;—violent exertion of the body, or local injury. Men are very much more subject to it than women;—and it is said that sailors, porters, and those who use the upper extremity, are most liable to aneurism of the axillary artery;—but post-boys and others who exert the lower extremity, to popliteal aneurism. It is most frequent between the ages of thirty and fifty.

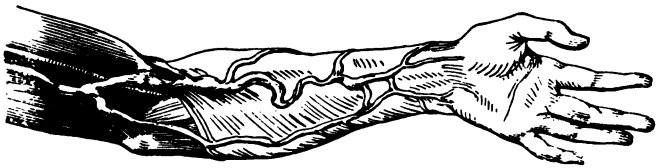
TREATMENT.—The indications are, to stop the circulation through the aneurism, and to produce coagulation of the blood within it.

Surgical.—If it can be done, the artery should be tied between the aneurism and the heart;—not too near the former, so as to place the ligature on a portion of the vessel that is diseased;—and not too far, lest the circulation through it be kept up by means of collateral branches. After the operation, the temperature of the limb falls two or three degrees;—but in a few hours rises rather higher than that of the opposite limb, because the blood is forced to circulate through the superficial capillaries. Subsequently it sinks again rather below the natural standard. Therefore the patient should be placed in bed, with his limb in an easy position; wrapped up, to preserve its circulation; and though it become rather swelled, (which is not unlikely,) cold must on no account be applied. If a ligature cannot be applied between the aneurism and the heart, it may be placed on the *distal* side;—but this is, according to Mr. Guthrie, a dangerous and uncertain operation, and should only be performed when the tumor is increasing very rapidly. After the operation the limb may become gangrenous, in the same manner as described at p. 103. If the gangrene spread beyond the fingers or toes, amputation should be performed above the level of the ligature. The application of *pressure* to the aneurism, or to the trunk above it,—or of *ice*, may have done good in some cases, but more frequently the reverse.—The *medical treatment* consists in measures that reduce the heart's action, without lowering the vital energies too much. *Bleeding* may be performed occasionally, if the patient be plethoric, and the tumor increase rapidly, with violent pulsation;—but it should never be carried to faintness. The *diet* should be light. *Bodily or mental exertion* and *fermented liquors* should be rigidly abstained from. Much benefit may be derived from digitalis in moderate doses;—but the most useful remedy is the acetate of lead given in doses of gr. ½—i ter die, with half that quantity of opium, and a draught containing acetic acid. But it must be recollected that *daily bleeding* and *rigid starvation* will increase the irritability of

the heart and arteries, and render the system incapable of forming healthy lymph ; consequently they will prevent the desired changes in the aneurismal sac.

DIFFUSED ANEURISM may be caused by rupture of an artery without a corresponding wound of the skin, so that the blood escapes into the cellular tissue. It is known by rapid dark-coloured swelling of a limb soon succeeding an injury ;—perhaps fluctuating, and sometimes pulsating. For this, as well for the aneurism formed by dilatation of the cicatrix of a wounded artery, the operation for ordinary aneurism is inadmissible ;—but the wounded part must be exposed, and both ends be tied.

ANEURISMAL VARIX is produced when an artery is punctured through a vein, and they adhere together, the communication remaining permanent. The vein becomes enlarged and tortuous.



VARICOSE ANEURISM is formed, when in addition there is a false or diffused aneurism between the artery and vein, opening into both, and formed of lymph that was effused between them. These two cases need not be interfered with, unless they enlarge rapidly, or cause inconvenience. If they do, a ligature must be placed both above and below the wound of the artery.

ANEURISM BY ANASTOMOSIS is a pulsating tumor, formed of several enlarged and tortuous arteries, accompanied with many dilated veins, which feel like a bundle of worms.

NÆVUS is a similar affection, consisting in an enlargement of very many small arteries. It appears soon after birth as a small red spot in the skin; which enlarges and forms a soft, dusky-red, pulsatory tumor, the skin covering which is so exceedingly thin, that profuse bleeding may occur from the slightest abrasion. This, like the preceding, may remain long stationary;—or it may ulcerate or slough, and cause the patient's death by repeated hæmorrhage. *Treatment.*—The small red spot which precedes nævus may be removed by touching it frequently with nitrate of silver. If nævus be *small*, an attempt may be made to obliterate the vessels composing it by the adhesive inflammation. This may be done by performing *vaccination* on its surface, (which generally fails,) or by passing a *seton* through it, (taking care that the threads be large enough completely to fill the aperture made by the needle,) or by *breaking up its substance* with a needle;—or by *injecting* a weak solution of zinc. sulph. into it by means of Anel's syringe;—or by *pressure*, if it be seated over a bone. All these measures (except the seton) are very uncertain. If that fail, the tumor should be extirpated entirely (the same treatment being also applicable to *aneurism by anastomosis.*) It may be done, 1, *by the knife*;—two elliptical incisions being made so as to remove

the whole of the diseased growth, which should not be cut *into*. 2. By *ligature*. A strong *double ligature* may be passed through

the sound parts beneath the tumor;—and then the thread should be tied as tightly as possible round each half of it. Or if it be large, *several double ligatures* may be passed, and the neighbouring threads be tied together. But the best plan of all is, to pass two or more needles crucially through its base, and then tie a ligature firmly round beneath them. If the disease be inaccessible to these means, (as in the orbit,) and increase rapidly, ligature of the common carotid (or of any other large trunk supplying it) is the only resource, but it is dangerous and not often successful.*

CHAPTER VIII.

OF INJURIES AND DISEASES OF VEINS.

I. Wounds.—The hæmorrhage from wounded veins may, in ordinary cases, be restrained by pressure and a raised position. If the vein be very large and deep, (as the internal jugular,) unremitting pressure should be kept upon it with the finger.

II. Subacute Phlebitis produces thickening of the coats of the vein, coagulation of the blood within it, and consequent obliteration of its cavity. It is known by tenderness and hardness of the affected vein, more or less swelling around it, and œdema of the parts below. It very commonly affects the veins of the thigh after delivery, constituting a mild form of *phlegmasia dolens*. *Treatment.*—Rest, leeches, and fomentations, or cold lotions;—subsequently, when tenderness abates, friction with mercurial and stimulating liniments, and bandages.

III. Acute Phlebitis is a most dangerous and generally a fatal disease. It is known by great tenderness and swelling in the course of the affected veins, together with irritative or typhoid fever;—frequent severe rigors;—prostration of strength and spirits;—exceedingly rapid pulse;—bilious vomiting—sallowness of skin;—rapid formation of *consecutive abscesses* in the joints, eye, or cellular tissue, but more frequently in the chest;—and death, preceded by dry black tongue, low delirium, and other signs of typhoid debility. On examination, some of the affected veins are found plugged with coagula;—others filled with flakes of lymph and pus. The extreme malignity of the constitutional affection does not depend on an extension of the inflammation to-

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* Vide Curling's Pathological Lectures in Med. Gazette, July, 1838.

wards the heart, as is often supposed; for Professor Arnott has shown, that the morbid appearances in the affected vein generally cease abruptly at the entrance of a collateral branch. But it is owing to the pus or other diseased fluids which are formed in the veins, and mix with the blood;—and which are also the cause of the *consecutive abscesses*, as has been mentioned at page 51. This disease may be *caused* by wounds of veins if irritated and not allowed to heal;—especially by tying them. It sometimes attacks the uterine veins after childbirth, constituting one malignant form of puerperal fever. *Treatment.*—As soon as the first signs of tenderness appear, leeches should be applied in great numbers over the inflamed veins, and the strictest rest should be observed. The *constitutional treatment* must depend on the state of the pulse and strength. Calomel, antimony, and opium may be administered; but bleeding, and in fact all lowering measures in excess, although they may diminish fever for a time, seem to hasten the ultimate stage of exhaustion.

IV. VARIX *consists* of an enlarged and tortuous state of the veins, which are generally thickened, rigid, and divided into irregular pouches, with their valves incapable of preventing the reflux of blood. This state may be *caused* by anything that retards the venous circulation;—such as occupations that require a standing posture; or pressure from loaded bowels or the gravid uterus. It is most frequently *seated* in the lower extremities, scrotum, and rectum. Its *consequences* may be (1) great pain and aching in the leg, when the body is erect;—so as to prevent standing or walking. (2) *Varicose ulcers*, or constant excoriation of the skin, (vide p. 73.) (3) Sometimes a vein becomes exceedingly thin, and bursts; causing profuse and dangerous hæmorrhage, inasmuch as there might be no valves between the part ruptured and the heart. (4) Occasional inflammation occurs, with clotting of the blood in the affected vein;—which may perhaps give rise to abscess. *Treatment.*—In the first place, measures should be adopted to prevent further enlargement, and induce contraction of the distended veins. If one or two trunks only are affected, it may be sufficient to apply pieces of leather spread with soap plaster firmly over them;—but if many smaller veins be enlarged, the whole limb should be well supported with a calico or caoutchouc bandage, or laced stocking, which should be applied in the morning before the patient rises. Friction with lin. hydrargyri;—or with iodine ointment;—the application of tincture of iodine, repeated blisters, and electric sparks, have been supposed to accelerate the cure. If these means fail, and the patient be subject to urgent inconvenience, the only resource is to obliterate the diseased veins. (1) *Brodie's plan.* A long, curved, narrow, pointed knife, like a bistoury, but cutting on the convex edge, is introduced by the side of the vein, and carried horizontally with its flat surface between it and the skin. Then the convex edge is turned towards the vein, in order to cut through

it, as the knife is being withdrawn. (2) *Mayo's plan.* A very narrow slip of skin, across the vein, is destroyed by means of a paste of potassa fusa and quicklime. This will most probably cause *subacute inflammation* of about an inch of the vein, with coagulation of the blood and obliteration of its canal for the same extent. (3) The latest and apparently the most successful plan consists in *passing a fine needle* behind the vein, and twisting a piece of thread very tightly round it, which must remain till the vein is divided by ulceration. But, before and after either of these operations, the greatest care must be taken to counteract inflammation.*

CHAPTER IX.

OF INJURIES AND DISEASES OF THE NERVES.

I. *Complete division* of a nerve is attended with palsy and loss of sensibility in the parts which it supplies. The nerve, however, will readily unite, in the same manner as bone or tendon, and sensibility and motion will return. The former has begun to return in three weeks, the latter in four. The same will also happen if a *small* portion be removed. Sometimes, however, the divided ends, instead of uniting, shrink and become bulbous.

II. If a nerve be partly divided, leaving some fibres on the stretch, as sometimes happens in venæsection, very disagreeable consequences may ensue; such as immediate severe pain, recurring in paroxysms, and shooting in the course of the nerves; violent spasms, or palsy of the limb;—fits of epilepsy;—and great disorder of the digestive organs. The same symptoms may also ensue if a nerve have been bruised, or compressed, or stretched;—or if it have been divided, and its extremity have become implicated and compressed in a cicatrix. This not unfrequently happens after amputation, and produces excruciating pain, with spasm and retraction of the muscles of the stump, causing it to become conical. *Treatment.*—If these symptoms come on *immediately* after a wound, so that it is probable that a nerve has been partly divided, an incision may be made so as to divide it completely. If, however, they appeared whilst a wound was healing, it is the best plan to remove the cicatrix entirely. But it unfortunately happens, that neuralgic pains, though produced by a local exciting cause, do not always

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* Arnott in M. C. T., vol. xv. Lee, *ibid.* Mayo, Pathol. Copland and others in Med. Gaz., July and August, 1838.

cease on its removal. If palsy or spasm arise from a blow on a nerve, leeches, blisters, and mercurials should be used as for inflammation.

III. *Inflammation of nerves* is known by pain and tenderness, with fever if acute. *Sciatica* is an example of rheumatic inflammation of the sciatic nerve. The local and general treatment must be antiphlogistic, according to circumstances.

IV. TUMORS in nerves may produce every local and general symptom of nervous irritation. The *painful subcutaneous tumor* is one instance. Iodine, counter-irritation, and the other means of exciting absorption, may be tried;—but if they fail, as they most likely will, the tumor must be extirpated, provided that it be not intimately embedded in the substance of a large nerve such as the sciatic, the division of which would paralyse a limb.

V. NEURALGIA may be *defined* to be severe pain affecting the nerves, not necessarily produced by organic lesion. It occurs in paroxysms of very severe pain, mostly of a plunging, lancinating character, shooting in the course of the nerves. It most frequently attacks those of middle age, female sex, and comfortable circumstances. The *exciting causes* (1) sometimes act upon the nerve that is the seat of pain. Thus it may be produced by wounds or other injuries, as before related;—by tumors; by spiculæ of bone pressing on the nerve, (which is a frequent cause of facial neuralgia;) or by some disease in the brain or spinal cord at its origin. (2) The pain may be caused *sympathetically* by influences that act upon distant parts, or on the system at large;—by loss of blood and debility;—by wet and cold;—by irritation of the skin from eruptions or wounds;—by carious teeth;—by disorders of the alimentary canal;—sometimes by diseases of the urinary or other internal organs;—lastly, by *malaria*. When arising from this last cause, it is generally *intermittent*, and occurs at regular intervals;—but it may also be periodic, when caused by a permanent local source of irritation. Its most frequent *seat* is the infraorbital nerve; but it may affect any external or internal part. The *nature* of the complaint is apparently *functional* derangement. The suddenness of its accession and departure,—and the absence of organic change in nerves that have been affected for years, prove that it is not essentially inflammatory;—although inflammation of a nerve, when existing, may doubtless be an exciting cause.

2. The same local and constitutional causes that give rise to neuralgia, may also occasion every other symptom that can be produced by functional nervous disorder; such as rigid and permanent spasm, (as in wry neck,) or twitching and convulsion of muscles;—difficulty of swallowing and performing evacuations, spasm of the œsophagus, of the sphincter ani, or of the perinæal muscles;—sneezing, dumbness, stammering, thirst, and affections of the sight and hearing

TREATMENT.—The *indications* are, (1) to remove all local

sources of irritation; (2) to amend any constitutional disorder; (3) to palliate pain.

1. The whole course of the affected nerve should be thoroughly examined, and if there be a cicatrix, or tumor, or wound;—or a carious tooth; or an abscess, or ulcer, or hernia, or aneurism,—measures should be taken for their removal. Sometimes leeches, blisters, issues, liniments, (especially F. 24,) or tartar emetic ointment applied in the course of the nerve, combined with proper constitutional remedies, may be successful, when surgical measures are either inapplicable or unavailing. The head, and particularly the spine, should be well scrutinised; and any pain or tenderness, or other genuine sign of congestion or disease, should be removed by local bloodletting and counter-irritation.

2. The state of the constitution must be regulated in the same manner as was directed in the treatment of chronic inflammation. If there be paleness of the lips, emaciation and debility, iron, bark, and other tonics may probably be given with advantage. Inquiry should always be made in these cases for piles, menorrhagia, or other weakening ailments. On the other hand, bleeding and low diet have cured cases attended with hard full pulse and plethora. In all cases, the appetite, the tongue, the biliary and alvine secretions, and the state of the uterine system, should be investigated. *Quinine*, *arsenic*, and *nux vomica* are especially serviceable in periodical attacks; and *colchicum* in cases connected with gout or rheumatism.

3. But if, as frequently happens, no cause can be detected,—or if its removal fail to cure the disease, a *tentative* and *palliative* plan of treatment is the only resource. *Purgatives; tonics; mercurials; sarsaparilla*, *valerian* and other *fetid stimulants; narcotics;* any remedies, in fact, that have been known to do good, may be tried in succession; taking care, however, not to impair the constitution by giving them at random. Opium, morphia, hyoscyamus, belladonna, conium, stramonium, and prussic acid given internally;—friction with ointments of veratria, strychnia, and aconitina (3ss ad ℥i)—sprinkling gr. ¼ of morphia or strychnia, on a newly blistered surface;—or inoculating it under the cuticle—acupuncture, issues, and moxa, generally afford some relief, and sometimes completely cure. *Division of the nerve*, with or without *excision* of a portion, is the last resource. It produces instant ease;—which, however, lasts but a short time;—and the oftener it is repeated, the more transient are its effects.

Hysterical neuralgia.—Hysterical females are subject to severe and permanent pain and tenderness of the joints; (especially the hip or knee;) with weakness of the limb, and inability to use it;—or to pain and tenderness of the spine, with perhaps spasms, or weakness of the legs, tympanites of the belly, and palsy of the bladder;—symptoms, in fact, of ulcerative disease of the joints or spine, that might mislead careless practitioners; more particularly

as they are often referred to some trivial injury. These cases may be known by observing that the patients are young females, perhaps newly married, most likely (but not invariably) subject to irregular menstruation, torpid bowels, and coldness of the extremities;—or perhaps to well-marked fits of hysteria. Not uncommonly some intimate friend has laboured under a similar complaint just previously. The pain is greatly aggravated by motion or pressure;—but it seems to be principally seated in the skin; and the patient shrinks from the least touch;—whilst, if her attention be engaged elsewhere, a somewhat rude examination may be made without complaint. The pain often prevents the patient from sleeping, but once asleep, she may continue so for hours. There may be some degree of swelling, but it is puffy and diffused,—and comes and goes capriciously. These complaints may last many years in defiance of all treatment, and then may vanish suddenly without assignable cause;—or perhaps from some strong impression on the nerves,—fright or fanaticism. *Treatment.*—Any detectable disorder of the digestive or uterine systems should be removed. The patient should have fresh air, generous living, and plenty of occupation for body and mind; she should be encouraged to take exercise, notwithstanding pain and weakness; and to resume as far as possible the habits of a healthy person. Copper, zinc, and iron, with assafœtida and other stimulants, may be given with benefit if the circulation be languid, and quinine if the pain be periodic. Brodie recommends warm fomentations, especially one composed of sp. rosmarin. ℥iss and mist. camph. ℥viss, or of lin. camph. ℥iv, with ext. belladon. ℥ii. Occasional leeching may be of service, but counter-irritants should be avoided. If the limb at any time become very hot, it should be sponged with tepid lotions;—but if cold, it should be wrapped up warmly in flannel and oiled silk.*

CHAPTER X.

OF INJURIES OF THE HEAD.

SECTION I.—WOUNDS OF THE SCALP.

Wounds and contusions of the scalp, be they ever so slight, are not to be neglected. They may be followed by erysipelas;—

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* Brodie on the Joints, 3rd ed., p. 302. On Local Nervous Affections, Lond. 1837. Rowland on Neuralgia, Lond. 1838.

or by inflammation and suppuration under the occipito-frontalis, or within the cranium, that might easily prove fatal. It may be observed, that the strictest antiphlogistic regimen must be maintained;—that sutures are generally inexpedient;—that although there be considerable arterial hæmorrhage, ligatures should be avoided, if it can be restrained by pressure;—that if a flap of the scalp is nearly or even quite detached, it should be carefully washed, and returned to its place, avoiding sutures and pressure by bandages and plasters;—that if a blow on the head causes an extensive and increasing extravasation of blood under the scalp, rendering it evident that an artery has been divided by the blow, the exact situation of the injured vessel should, if possible, be ascertained, and pressure be applied there;—that early and free incision must be made in the event of suppuration under the occipito-frontalis;—but that if blood be extravasated there, its absorption is to be promoted by bleeding, cold, and low diet; and no incision is to be made, unless positively necessary.

SECTION II.—CONCUSSION OF THE BRAIN.

DEFINITION.—Concussion signifies an interruption of the functions of the brain, induced suddenly by mechanical injury, and not necessarily attended with organic lesion.

SYMPTOMS.—More or less diminution of consciousness, sensation, and voluntary motion, with feebleness of the pulse. (1.) In ordinary cases, the patient lies for a time motionless, unconscious, and insensible; if roused and questioned, he answers hastily, and instantly relapses into insensibility; after a time, he moves his limbs as if in uneasy sleep, and frequently recovers his senses instantly after vomiting;—remaining, however, giddy, confused, and sleepy, for some hours. (2.) In the more severe degree the patient is profoundly insensible, the surface pale and cold, the features ghastly, the pulse feeble and intermittent, or perhaps insensible, and the breathing slow, or performed only by a feeble sigh, drawn at intervals.

Vomiting is an important symptom. It is not present in very slight cases, nor in very severe ones;—and its occurrence is mostly an indication of approaching recovery.

CONSEQUENCES.—Concussion may terminate, (1) *in death*, from failure of the heart's action. (2.) It may be succeeded by inflammation. (3.) It may leave impairment of the memory, or of the senses, especially of smell and hearing, and a constant tendency to inflammation, and to extravagant actions upon any slight excitement. (4.) It may be soon succeeded by a peculiar state of insensibility, which may last some days. The patient lies as if in a tranquil sleep; his pulse is regular; but on the slightest exertion it rises to 130 or 140, and the carotids beat vehemently;—when

roused he answers questions, but immediately relapses into unconsciousness. Some patients in this state resemble somnambulists; they may get out of bed, bolt the door, shave, or make water, but still are insensible to what passes around.

PATHOLOGY.—The brain is often found bruised, or ecchymosed, or lacerated; but still concussion may be fatal, without any injury that can be detected by dissection.

PROGNOSIS.—Few persons die of concussion solely; but if the heart's action and respiration be much and long oppressed, the danger will be great.

DIAGNOSIS.—Concussion may be thus distinguished from the insensibility arising from compression. In concussion the insensibility comes on *immediately* after the accident;—in compression it *may* come on after an interval. In concussion the pulse is weakened; and the greater the insensibility the weaker it will be;—in compression the pulse may be full and hard, and the skin hot. Stertorous breathing is rare in concussion, frequent in compression. The pupil in the former is variable, sometimes contracted, sometimes dilated, but in severe cases equally insensible to light; in the latter it is generally dilated and insensible. The rise of the pulse on any exertion is another distinctive symptom of concussion.

TREATMENT.—The *indications* are: (1) to recover the patient from insensibility and collapse; (2) to prevent inflammation; (3) to restore any faculties that may remain impaired.

1. If the depression be very great, and the pulse very low, warmth may be applied to the surface, and ammonia be held to the nostrils, and administered internally. But in general the patient should be left to recover by himself, because, in case of laceration of the brain, stimulants would increase the effusion of blood.

2. After reaction has taken place, the patient (unless too young or feeble) should be bled;* at all events, the bowels should be freely acted on, and perfect rest and low diet should be observed. If the pulse become hard and frequent, the bleeding and purgatives should be repeated as often as may be necessary, with saline and antimonial draughts in the intervals; and the head should be shaved and kept wet with evaporating lotions. As a

* Whether the patient has recovered his consciousness or not, he should be bled if the pulse become hard, and the skin hot. But bleeding is not a remedy for concussion itself;—it merely removes its consequences; and if employed during a depressed state of the circulation, may induce epileptic convulsions, or perhaps death. In every case of sudden insensibility, whether from disease or accident, the vulgar clamorously demand that the patient should be bled; but the surgeon must be very ignorant or very weak if he yields to their wishes.

general rule, after any severe blow on the head, the patient should observe a cautious antiphlogistic regimen for a month or six weeks, —carefully keeping himself free from all fatigue, intemperance, and excitement.

3. In order to remove headache, deafness, giddiness, squinting, loss of memory, tinnitus aurium, and other remote consequences of concussion, a course of mild alterative mercurials;—repeated blisters, or an issue or seton;—the shower-bath, change of air, general friction of the surface, and a most regular diet, are the remedies.

SECTION III.—COMPRESSION FROM EXTRAVASATED BLOOD.

SYMPTOMS.—The symptoms of compression are those of apoplexy. Insensibility; general palsy, (sometimes, but rarely, confined to one side;) dilated and insensible pupil; slow, labouring pulse; skin often hot and perspiring; retention of the urine, through palsy of the *detrusor urinæ;* involuntary discharge of the fæces through palsy of the *sphincter ani;* and stertorous breathing, owing to palsy of the *velum pendulum palati.*

VARIETIES.—Compression may co-exist with concussion; the symptoms immediately after the accident being those of the latter, and the pulse being very feeble. The pupils are sometimes contracted, or sometimes one is contracted and the other dilated.

CAUSES.—Compression may be produced by three causes. (1.) Extravasation of blood. (2.) Fracture of the scull. (3.) Suppuration in its cavity.

The *symptoms of compression from extravasated blood* generally show themselves in the following manner. The patient receives a blow, and suffers from concussion; after a while he recovers his senses, and then gradually becomes comatose. Or the symptoms of compression may succeed those of concussion without any interval.

The blood may be situated, (1) between the dura mater and skull; and if in large quantity, it proceeds from laceration of a branch of the middle meningeal artery; (2) between the membranes; (3) in the substance of the brain.

TREATMENT.—The head should be shaved and examined, and if there be no sign of fracture, the case must be treated as one of apoplexy; the *indications* being to avert inflammation, and procure absorption of the blood by bleeding, cold to the head, purgatives, and calomel in repeated doses. Frequently a puffy swelling arises after a day or two, and points out the seat of the blow. If the symptoms are unrelieved by the above measures, the last resource is trephining;—which operation should be performed at the seat of the injury, if that be known,—or if that is not known, it should be done where any puffy swelling arises;—or lastly, if there be no puffy swelling, it should be done over the middle meningeal artery; and if one side is more palsied than the other, it

should be done on the other. The trephine should be rather large. That extravasation only which is between the dura mater and skull admits of relief by this operation; and blood, if found there, must be carefully removed by a sponge; but the dura mater must not be punctured to search for it, unless fluctuation be very palpable indeed. The skull is said always to be white and bloodless at the seat of effusion between it and the dura mater, because it is deprived of its supply of blood from that membrane. This, therefore, is an important diagnostic sign; and in a desperate case it might be advisable to cut through the scalp, and examine the bone at any part where mischief is suspected to exist.

SECTION IV.—FRACTURE OF THE SKULL.

DIVISION.—Fractures of the skull are divided, (1) into those which consist of a mere crack or fissure without displacement; (2) into those in which the fragments are displaced or depressed. Fracture most frequently occurs at the part where the injury was received;—but it may in some cases be seated exactly opposite; this is called *counter-fissure*. *Fracture of the base of the skull* is the most dangerous kind. It is caused when the patient falls from a height, and pitches on his head; the basilar process being snapped through by the weight of the whole body, which tells upon it through the spinal column. In these cases there is frequently a copious venous hæmorrhage from the ears, in consequence of lacerations of the sinuses at the base of the brain. It is a most unfavourable symptom, although a slight hæmorrhage from the ears, or nose, or mouth, may depend on an insignificant rupture of the membrana tympani, or of the mucous membrane of those parts. These cases mostly terminate fatally, although there is one instance of recovery on record.

1. *Fissure* requires no treatment apart from that of the concussion, compression, or scalp wound, with which it may be accompanied.

2. *Fracture with depression* may be *simple* or *compound;* that is, attended with a scalp wound.

(*a.*) *Simple fracture with depression* is to be ascertained by a careful examination of the shaved scalp, when, if it exist, there will be felt a depression at one part, with a corresponding edge or projecting ridge near it. *Diagnosis.*—Sometimes a coagulum of blood under the scalp conveys the feeling of a sharp elevated ridge of bone;—it may be known, however, by yielding to firm pressure with the finger. But although there may be a real fracture with depression, still there may be no compression of the brain; because the outer table may merely have been driven into the diploe, or the outer wall of the frontal sinus may have been broken in. The former accident could only happen to a patient of middle

age, because the diploe neither exists in infancy nor old age;—the latter will be known by the escape of air, when the nose is blown forcibly, either into the cellular tissue of the forehead, or out of the wound if there be one. *Treatment.*—In a case of *simple* depressed fracture, if there be no symptoms of compression, (and there sometimes are not,) and if the patient is conscious and rational, no incision should be made through the scalp, nor should the trephine be immediately resorted to;—but he should be bled, purged, and kept under the strictest antiphlogistic regimen; and then perhaps recovery may be completed without the slightest appearance of compression, and inflammation averted. Even if there be *slight* symptoms of compression, the same plan is to be adopted, in the hope that they may be removed by free depletion; but if they be severe, or if they do not yield, the depressed bone must be elevated by trephining. In children, whose bones are soft and thin, great indentations and depressions may be produced without fracture. They are to be treated upon the principles already laid down; and if the bowels are kept well open, they may not cause any bad symptom whatever, and the bone rises in time to its proper level.

(*b.*) In the case of *compound* fracture with depression, whether there be symptoms of compression or not, the bone must be elevated. If possible, it should be done with the elevator; but if one piece of bone is wedged in under another, a *small* aperture should be made with the trephine, in order to make room for employing the elevator. If any pieces of bone are perfectly loose and detached, they must be removed; but not if they have a pretty good adhesion to the pericranium and dura mater.

SECTION II.—WOUNDS OF THE BRAIN, HERNIA CEREBRI, &c.

Wounds of the dura mater add very considerably to the danger of compound fractures of the skull, both from the risk that inflammation may spread over the surface of the arachnoid, and from the greater chance of hernia cerebri. Hence this membrane should never be indiscreetly wounded. If the arachnoid be wounded as well, the danger is less, because granulations then speedily shoot up, and close the communication between the wound and the cavity of the arachnoid.

Wounds of the brain, whether incised or lacerated, are not of necessity attended with any mental or bodily disorder, besides that which arises from the concussion, compression, or inflammation that may accidentally be present. Instances are numerous in which portions of the brain have been lost without any ill consequences at the time or afterwards. But yet Sir B. Brodie has observed in some cases a greater degree of mental confusion than usually attends concussion, and in others spasmodic twitchings of the muscles.

If *foreign bodies* are embedded in the brain, the danger will be materially augmented. But it is a rule laid down by the best authorities, that no foreign body, whether a portion of the skull or not, is to be removed, if the removal will add in the least to the irritation or injury.

The *treatment* of these wounds consists in the prevention of inflammation;—and in causing the wound to cicatrise without the formation of *hernia cerebri*.

HERNIA CEREBRI.—When a portion of the skull has been removed, the brain, impelled by its arterial circulation, may protrude through the aperture in the form of rounded tumor, styled *hernia vel fungus cerebri*. If the dura mater were still entire, it sloughs. The tumor consists of brain in which more or less clotted blood and lymph are effused, and of fungous granulations. As it increases in size, it suffers constriction from the aperture through which it passes, and sloughs, but is speedily succeeded by a similar growth, which undergoes the same processes, till the patient dies of the irritation. *Treatment.*—In order to prevent this affection, a well-regulated pressure, just sufficient to afford a natural support, should be made upon the brain (by means of compresses of soft lint oiled) in all cases where the skull is perforated. If the fungus have already protruded, the best application is liq. calcis, with which the lint may be wetted. If this fail, and the degree of pressure requisite to prevent increase cause symptoms of cerebral oppression, the part should be shaved off level with the scalp, and any further growth be prevented by the liq. calcis and lint, and pressure, as before.

SECTION VI.—INFLAMMATION AND SUPPURATION.

GENERAL DESCRIPTION.—Inflammation of the brain rarely makes its appearance till a week after an injury, frequently not till three weeks, or even later. Its symptoms and progress are very various; sometimes sudden, violent, and soon terminating in destructive suppuration;—sometimes slow, insidious, and unsuspected, till suddenly manifested by fatal coma or palsy.

SYMPTOMS.—*First stage.* The patient complains of pain in the head, aggravated by heat, motion, and anything that causes excitement of mind or body, together with languor, confusion of ideas, quick pulse, disturbed sleep, nausea and want of appetite, and alternate flushing and paleness. *Second stage.* These symptoms soon become aggravated; there is a violent rigor, followed by burning heat of the skin;—the pulse is hard and frequent, the carotid and temporal arteries pulsate vehemently;—the headache becomes most intolerable and throbbing, the pupils are contracted; light is insupportable to the eyes, and sound to the ears; the

tongue is dry, the bowels obstinately costive, and retching frequent. Besides these symptoms, violent delirium or convulsions come on at intervals, or perhaps coma. If they are unrelieved, the *third stage* soon follows. The pulse loses its force, and becomes either slow and oppressed, or excessively rapid; and squinting, low delirium, convulsions, or palsy, soon usher in death. Rigors, followed by squinting, dilated pupil, stertorous breathing, coma, and palsy, are indications of suppuration.

If there be an external wound, it swells and becomes puffy;—the pericranium is separated from the skull by the exudation of a thin fluid;—the granulations become pale and flabby, and either are dry, or secrete a gleety sanious matter;—and the bone becomes white, dry, and bloodless; changes that are owing to the obstruction of the nutrient vessels that naturally pass from the dura mater to the skull, in consequence of the inflammation or incipient suppuration of that membrane. If there be no wound, still the scalp may present the puffy swelling that has been before spoken of. If the dura mater is exposed, it at first appears of "a dull, sloughy cast, and smeared over with something glutinous;" and subsequently is covered with matter.

PATHOLOGY.—It is believed that if the membranes and surface of the brain be inflamed, there will be greater pain, and a greater disposition to delirium and convulsions;—but that in inflammation of the cerebral substance there will be an early tendency to coma and palsy.

PROGNOSIS will be unfavourable if the malady have advanced to its second stage, and is not promptly relieved by depletion.

TREATMENT.—Upon the first appearance of the symptoms, bleeding should be performed, (perhaps from the temporal artery or jugular vein,) to the approach of faintness; the bowels should be most freely opened, and the head be shaved and kept cool and elevated. If they do not yield, the bleeding should be repeated as often as may be necessary; leeches should be freely employed, and from two to six grains of calomel, with a quarter or half a grain of tartar emetic, (not enough to cause vomiting,) should be given every two or three hours. The remedies for the third stage are blisters to the head or its vicinity;—mustard cataplasms to the feet;—terebinthinate or stimulant enemata;—and trephining, if suppuration is indicated by symptoms of compression, or by the above-mentioned state of the wound. The trephine should be large, and if the matter be seated between the dura mater and skull, it may afford relief, although it rarely does.

Abscess in the brain, or *softening*, (pulpy disorganisation, or gangrene,) may be very remote consequences of injury; not occurring perhaps for years. Their *symptoms* are very obscure and insidious. Occasional headache; general loss of health and strength; impairment of the memory or other mental faculties;

quick pulse, and furred tongue; disorder of the eyes or ears; sense of constriction, or of coldness in the scalp, or of creeping in the limbs, with numbness, are the most frequent. But these are succeeded by sudden convulsions, or palsy, or coma, from which the patient soon dies, although he may perhaps recover for a time. *Treatment.*—Blisters, issues, setons, or the tartar emetic ointment; —mercurial alteratives; — purgatives; — occasional depletion; — shower-baths;—the most regular diet, and avoidance of excitement, are the remedies in case mischief is suspected. After the occurrence of more decided symptoms, blisters;—depletion, if the pulse is strong enough, purgatives, and enemata. If the patient is low and feeble, mild stimulants and nutriment.

CHAPTER XI.

OF THE DISEASES AND INJURIES OF THE SPINE.

I. LATERAL CURVATURE is a simple distortion of the spine from debility of its bones, ligaments, and muscles. The first thing that attracts attention is a projection of one scapula, or of one side of the bosom, or an elevation of one shoulder, (most commonly the right,) which are popularly, but erroneously, supposed to be *growing out.* On examination, the spine is found to be curved like an italic *f*;—the right shoulder projecting, and the right side of the chest and the left hip unnaturally convex;—whilst the chest on the left side and the loins on the right are correspondingly curved inwards. This affection occurs almost exclusively to young females between the ages of eleven and sixteen, and is readily *caused* by occupations or postures that tax one side of the body more than the other,—if at the same time the patient be subjected to want of exercise, or other influences that deprive the muscles and ligaments of their natural elasticity and vigour. *Treatment.*—Attention must be paid to the four following circumstances; viz. position, exercise, rest, and support. (1) In the first place, the patient must be watched, in order to find out from what particular attitude or habit the distortion takes its rise. Standing on the right leg is the most frequent, for in this posture the left side of the loins is thrown upwards, and the patient is obliged to raise the right shoulder to keep the body perpendicular. A habit of raising the right shoulder whilst writing, or drawing, or playing the harp, or riding on horseback,—or of sleeping constantly on one side with too high a pillow, —or the abominable custom of wearing dresses made low on the chest, so that the patient hitches her frock up on one shoulder and

lets it fall off the other, are also occasional causes. And all of these, and every other one-sided posture, should be vigilantly prohibited. (2) The patient should take free exercise in the open air, whether walking or riding, or indulging in any games or sports, such as the dumb-bells, the skipping-rope, drawing a light garden roller, hopping, or carrying weights in the hands. The *club exercise*, introduced by Mr. Angelo into the regular cavalry training, is extremely advantageous.* It consists in a series of exercises for the arms, whilst a club or loaded stick about two feet long and from two to seven pounds in weight is held in each hand. In this, as well as in using the dumb-bells, or other exercises performed in a standing posture, the heels should be closed, the feet at an angle of 60°, the knees straight, the belly thrown back, (so that it may not be strained,) the chest forwards, and the shoulders square; and whilst both sides are duly exercised, the weaker one should be principally brought into play. (3) These exercises should never be carried so far as to fatigue, and after using them the patient may lie down on her back on a flat inclined plane, although any easy posture on a bed or sofa, or on the floor, will do as well. She should never be forced to stand longer than is perfectly agreeable, and when sitting should rest herself well against the back of the chair. Her seat should be wide enough to reach to the knees, and the feet should be well supported. (4) These measures, combined with tonics, good diet, country air, bathing, friction of the back, and attention to the health, may be sufficient to cure incipient cases, and to palliate severer ones. But if the weakness or distortion be very great, the spine must be assisted by mechanical support, such as stays made so as to rest on the hips, and receive the weight of the body at the axillæ. But the ordinary stays should be entirely abandoned, as in fact they are by all women that have any regard for gracefulness.

II. Angular Curvature (Pott's curvature) is produced by caries of the bodies of the vertebræ, or ulceration of the intervertebral substance. *Symptoms.*—1. Pain at a particular part of the back, aggravated by motion,—great tenderness on pressure; and a peculiar dead sickening sensation like that of a carious tooth, if a smart blow be struck on the part with the knuckles. 2. Curvature of the trunk forwards, and projection of the spinous processes of the diseased vertebræ backwards, in consequence of the destruc-

* Proposed Regulations for the Instruction &c. of the Cavalry. Part I. Published by Authority. Lond. 1832. Page 11. It were to be wished that Mr. Angelo, or some one equally qualified for the task, would publish a judicious system of gymnastic exercises to be used in the education of girls. Walker's "Exercises for Ladies" is in many parts unfit for the perusal of young females, and contains one or two exercises that are positively injurious.

tion of their bodies. 3. Pain, numbness, coldness, spasms, or palsy of the extremities, (stumbling in walking is an early symptom,) or signs of visceral disorder, costiveness, flatulence, incontinence or retention of urine, or an alkaline or albuminous state of that fluid, owing to irritation or compression of the cord. If the disease be seated in the cervical vertebræ, palsy of one or both arms generally precedes palsy of the legs or disorder of the breathing. Caries of the dorsal vertebræ is attended with constriction of the chest or upper part of the abdomen. *Consequences.*—1. In favourable cases, abscesses, if they form, are healed, or their matter is absorbed; the diseased bones collapse, and the patient recovers with more or less deformity, which is of course incurable. 2. In some fatal cases the patient dies suddenly from two or three of the diseased vertebræ giving way and crushing the spinal cord, or from dislocation of the odontoid process, owing to ulceration of its ligament, or from the bursting of abscesses into the spinal cord, or into some visceral cavity; but more frequently death is caused by slow irritation and exhaustion.

Diagnosis. This affection must not be confounded with its hysterical counterfeit spoken of in the ninth chapter. Curvature from debility or rickets may be known by being gradual and rounded, not angular and abrupt, and by its generally occupying the whole spine. *Causes.*—Those of caries. *Treatment.*—Rest in the horizontal posture is absolutely necessary. A water-bed or fracture-bed may be used, if easy or convenient. But the patient must not be taught to lie on his back, nor must any means be used with a view of straightening the spine, as they would merely impede the natural process of recovery, by preventing the remains of the diseased vertebræ from falling together. A bandage, containing strips of whalebone, and reaching from the head to the hips, is of use in keeping the trunk at perfect rest. 2. Issues should be made and be kept open with caustic on each side of the spinous processes of the diseased vertebræ. At the same time, steel, iodine, or other tonics or alteratives, may be given if required. These measures should be continued till pain and tenderness cease.

III. Abscesses arising from diseased vertebræ sometimes point in the back, (constituting *lumbar abscess* if low down,)—sometimes the matter makes its way between the abdominal muscles,—sometimes enters the sheath of the psoas, (constituting *psoas abscess*,) causes absorption of that muscle, and points below Poupart's ligament, or perhaps passes backwards to the nates. Psoas abscess appears as a fluctuating tumor below Poupart's ligament;—diminishing or disappearing when the patient lies down, and receiving an impulse on coughing. Its diagnosis is alluded to in the chapters on Aneurism and Hernia. If these abscesses enlarge in spite of the measures directed against the vertebral disease, they must be treated in the manner directed for *large chronic abscess*, p. 61.

IV. Injuries.—1. *Dislocation and Fracture.*—Dislocation is rare

except in the cervical vertebræ, but it occasionally does occur even in the lumbar and dorsal without any accompanying fracture. Fracture generally passes transversely across the body and arch of a vertebra ;—and as in dislocation, that part of the trunk which is above the injury is thrown forwards, so that the spinal cord is compressed or lacerated.

If the injury affect one of the lumbar or lower dorsal vertebræ, the legs and lower part of the trunk are palsied and insensible,—the penis is erect,—the fæces are discharged involuntarily, owing to palsy of the sphincter ani,—and the urine cannot be voided voluntarily, owing to palsy of the muscular coat of the bladder. Immediately after the injury, the secretion of urine is diminished, but in a few days it becomes copious, ammoniacal, and offensive, and the mucous coat of the bladder inflames and secretes a quantity of viscid adhesive mucus. The bowels are distended with wind, and obstinately costive ;—in protracted cases the evacuations become black, treacly, and extremely offensive. The temperature of the palsied parts at first rises,—in one case so high as 111° F.

If the fracture or dislocation be high in the back, or at the lower part of the neck, there will, in addition to the above symptoms, be palsy of one or both arms, and great difficulty of breathing, especially of *expiration*, because the intercostal and abdominal muscles are palsied, and the diaphragm has no antagonist.

If the injury be above the origin of the phrenic nerve, (fourth or fifth cervical,) the diaphragm is palsied, and death instantaneous. The most frequent example of this is the dislocation of the odontoid process, which is sometimes caused by ulceration of its transverse ligament, sometimes by blows on the back of the head, or by lifting a child up by the head.

2. *Concussion* may be caused by violent blows, and is attended with precisely the same symptoms, according to the seat of the injury. If they come on gradually after a blow, it may be conjectured that they are caused by the pressure of extravasated blood.

3. *Softening* is a frequent consequence of concussion or laceration. The affected part of the cord becomes pulpy and diffluent, without, however, any traces of inflammation.

4. Acute inflammation is a very rare consequence of injuries, except penetrating wounds, which generally prove speedily fatal in consequence. It is known by rigors, delirium, opisthotonos, or general convulsions, followed by palsy and coma.

Prognosis.—If a fracture be high up, so as to affect the respiration, the patient rarely survives more than a day or two. If fracture be in the lower part of the back or loins, he may live two or three weeks or months, but in some rare cases recovery has occurred, with, of course, permanent paraplegia. The prognosis is very uncertain after severe blows ; sometimes the patient has recovered the use of his limbs even after complete paraplegia,—sometimes recovery occurs with permanent paraplegia,—sometimes the patient

most unexpectedly becomes paralytic, and dies from slow disorganisation of the cord.

TREATMENT.—1. If there be any displacement, an attempt may be made to reduce it by extension and pressure. In dislocations of the neck, however, the attempt should be very cautious indeed, or it may produce instant death. 2. The patient must be kept at perfect rest in the horizontal posture, and the greatest care must be taken to prevent or delay *gangrene from pressure*, by arranging pillows, &c. Nothing can be better than Macintosh's air-cushions, half filled with water. 3. The urine must be drawn off by the catheter, and the bowels be kept open by powerful purgatives, to which Sir B. Brodie recommends ammonia to be added. Tonics and the muriatic acid may be given to support the strength, and obviate the derangement of the urine. 4. Bleeding must be employed if the pulse be firm, and there be great pain. But in the majority of cases, if fracture have occurred and the cord be injured, bleeding is contra-indicated by the pulse, and would hasten a fatal issue. 5. If the patient recover with his life, any remaining weakness or palsy may perhaps be attempted to be removed by the cautious use of blisters or issues, friction, warm bathing, and the internal use of strychnine, but they will very rarely do any good.*

CHAPTER XII.

OF THE INJURIES AND DISEASES OF THE EYE.

SECTION I.—OF WOUNDS AND FOREIGN BODIES.

1. WOUNDS of the eyelids or eyebrows should be most carefully adjusted by means of small silk sutures, introduced with a very fine sewing needle. A linen rag wetted with cold water should then be laid on the part,—inflammation should be counteracted, and the patient be kept at rest till the wounds are healed. Wounds of the forehead are liable to be followed by amaurosis, in consequence of injury to the frontal nerve.

2. BLOWS on the eye may be followed by ecchymosis and inflammation, or by blindness from concussion of the retina. Antiphlogistic measures are the only resource.

3. When a patient complains of a *foreign body* in the eye, the surgeon should first examine the inside of the lower eyelid and lower

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* Vide Cooper on Dislocations, and Brodie on Injuries of the Spinal Cord, in M. C. T., vol. xxi.

part of the globe, telling the patient to look up. If nothing be discovered there, the eye should be turned downwards, so as to expose the upper part of the globe, whilst the upper eyelid should be turned inside out, which may easily be done by taking the eyelashes between a finger and thumb and turning them upwards over a probe. If any substance stick into the cornea, so that it cannot be removed by a probe, or silver toothpick, or fine forceps, the point of a cataract needle or lancet should be carefully passed under it so as to lift it out. If, however, the removal cannot be effected without considerable difficulty, it is better to leave it to be detached by ulceration. Every means must be taken to obviate inflammation, and if the wound in the cornea be painful or irritable, it should be touched with nitrate of silver. To remove particles of lime or mortar, the eye should be well syringed or sponged with weak vinegar and water, or with oil, or with pure water if neither be at hand.

4. PROLAPSE OF THE IRIS in consequence of penetrating wounds of the cornea may be attempted to be reduced by closing the eye, and very gently rubbing the lid against the cornea, or by exposing it to a strong light, so as to cause the pupil to contract;—that is, if the pupillary margin is not itself prolapsed. If it is, belladonna should be applied to cause dilatation.

SECTION II.—DISEASES OF THE EYELIDS, AND LACHRYMAL APPARATUS.

1. HORDEOLUM, or sty, is a small painful boil at the edge of the eyelid. *Treatment.*—Leeches, poultices, and early puncture, (which will perhaps permit some concreted sebaceous matter to be squeezed from an obstructed meibomian follicle—a frequent cause of the complaint;) subsequently ung. hydr. nitrat. dilut., to remove any remaining hardness. The health must be attended to.

2. OPHTHALMIA TARSI is an inflammation of the edge of the eyelids, with disordered secretion of the meibomian glands—so that the eyelids stick together and become encrusted with inspissated mucus during sleep. It may be *acute*;—attended with great pain and soreness, and requiring leeches or even bleeding—but in general it is chronic and obstinate, and attended with violent itching. It occurs in weakly persons with disordered digestive organs. It may lead to ulceration of the eyelids, loss of the lashes, and subsequent thickening or inversion. *Treatment.*—The bowels must be opened, the biliary secretion regulated, and the general health improved, according to the directions for chronic inflammation and scrofula. Whilst there is heat or swelling, poppy fomentations should be applied, and the edges be smeared with lard—subsequently an astringent collyrium (F. 36) should be often used during the day, and the lids should be touched at night with weak

ung. hydr. nitric oxyd., (gr. v. ad ℥ss,) or ung. hydr. nitrat. (℥i *cum* ol. amygdal. f℥iii.) The lashes should be plucked out if there be ulceration.

3. Syphilitic Ulcers of the eyelids, if primary, will be known by their sudden appearance and rapid progress in a patient otherwise healthy, and by their not having been preceded by a wart or tubercle like malignant ulcers. Secondary ulcers will be known by their coppery colour. *Treatment.*—Mercury, and the treatment of syphilis generally,

4. Trichiasis signifies a growing inwards of the eyelashes. The misplaced hairs must be perpetually plucked out, or if that do not suffice, their bulbs must be extirpated.

5. Entropion, permanent inversion of the eyelid, may (1) be caused by the contraction of its ciliary margin, after ophthalmia tarsi—the remedies for which are, either to make two perpendicular cuts with scissors quite through the lid, near each angle—or rather to dissect off the edge of the lid with the lashes and their bulbs. (2) If there is no disease of the margin of the lid, and the patient is old, with the skin of the cheek loose and flabby, a flap of the loose skin, and of the orbicularis beneath, should be cut out of the eyelid, in order that the inversion may be counteracted by the contraction of the cicatrix.

6. Ectropion, or eversion, may be caused by a fleshy thickening of the conjunctiva, owing to long-continued inflammation. The weak ung. hydr. nitric. oxyd., or lotion of arg. nit. (gr. ii ad ℥i) may be tried first, and if they do not succeed, a portion of the thickened conjunctiva must be removed by scissors. This failing, it may be necessary to cut out a triangular slip from the tarsus. If caused by a cicatrix on the cheek, the cicatrix must, if possible, be dissected out. *Lagophthalmus*, (hare eye,) a shrinking of the eyelid, so that it cannot cover the eye, must, if produced by the same cause, be treated in the same manner.

7. Ptosis, a falling of the upper eyelid from palsy of its levator muscle, may be a precursor of apoplexy, and be attended with headache, giddiness, and other signs of congestion in the head, which should be treated by bleeding, purgatives, mercury, blisters, &c. If it occur without any assignable cause, and persists notwithstanding the employment of every measure calculated to improve the health, a portion of skin must be snipped out from under the eyebrow, so that the lid may be attached to the occipito-frontalis, and be elevated by it.

8. Ancyloplepharon.—Union of the edges of the lids, when complete and congenital, (which is very rare,) may be removed by an incision;—when partial, and consisting of a junction of the lids near one angle, which is sometimes caused by cicatrising ulcers, it is incurable.

9. Symblepharon, an union of the lid to the globe, following some accident that has caused ulceration of both—the introduc-

tion of lime, for instance, is irremediable, if the adhering surfaces are extensive. Very slight adhesions (frœna) may be divided.

10. TUMORS, vascular or encysted, occurring outside the eyelids, are to be treated the same as elsewhere. Sometimes thin cysts, or hydatids, containing a watery fluid, grow beneath the loose fold of conjunctiva which passes from the lid to the globe. If that fold be divided longitudinally, they may be extracted by a hook or forceps. Small encysted tumors or abscesses sometimes grow from the surface, or within the substance of the tarsal cartilage. They should be punctured from within.

11. EPIPHORA, redundancy of tears, depending on general irritability of the eye, is not unfrequent in scrofulous children. It should be treated by aperients and alteratives, with tonics and antacids, (F. 28, or quina, with small doses of sodæ carb.) An emetic may be given if the stomach is foul. The same local applications may be used that are prescribed for scrofulous ophthalmia. Search should be made for foreign bodies or inverted eyelashes.

12. CLOSURE OF THE PUNCTA LACHRYMALIA is an occasional cause of epiphora. The openings must be restored by a fine gold pin, and one of Anel's gold probes should be frequently passed through them. It must be introduced first perpendicularly, then horizontally towards the nose.

13. OBSTRUCTION OF THE NASAL DUCT is known by watering of the eye, dryness of the corresponding nostril, and distension of the lachrymal sac, which forms a small tumor by the side of the nose, from which the tears can be squeezed upwards through the puncta, or downwards into the nose, if the obstruction be not quite complete. It mostly leads to,

14. CHRONIC INFLAMMATION OF THE LACHRYMAL SAC — tenderness, perhaps redness of the superjacent skin, irritability and constant tendency to inflammation of the conjunctiva; and if the sac be squeezed, glairy mucus escapes with the tears.

15. ACUTE INFLAMMATION of the sac is known by great redness, swelling, pain, and tenderness, at the inner side of the nose, implicating the eye, and attended with fever and headache. If it be not soon relieved, the sac may suppurate and burst, forming an ugly fistulous orifice, crowded with fungous granulations, and with the skin around red and thickened. *Treatment.*—Acute inflammation must be treated by leeches, (or bleeding,) purgatives, and cold lotions or poultices. If the pain increase in severity, and become throbbing, the sac should be opened.

In other cases, chronic inflammation should be got rid of by an occasional leech, and attention to the digestive organs. When the sac becomes distended, the patient should press its contents down into the nose, and should frequently inspire strongly whilst his mouth and nostrils are closed. The secretions of the eyelids should be corrected with the ointments above mentioned, and a few drops of some astringent collyrium (F. 36) should be put twice a day into

the inner angle of the eye, so that it may be absorbed by the puncta, and carried into the sac. By these means the thickening of the duct may perhaps be removed; at all events the patient may go on pretty comfortably.

But if there be constant irritability of the eye, or if there be a fistulous orifice between the sac and the cheek, the obstructed duct should be restored. If there be a fistulous aperture—fungous granulations, or thickening of the skin, should be first removed by nitrate of silver and poultices. If there be not, the sac should be opened by a lancet, introducing it just below the *tendo oculi*, and carrying it downwards and outwards for one fifth of an inch. The escape of tears and mucus shows when the sac is opened. Then a common probe should be pushed through the duct into the nose. It should be pushed downwards, but a little backwards and inwards. It will be known to have reached the nose by the escape of a little blood. When inflammation has subsided, a *style* should be introduced, *i. e.* a silver-gilt probe about an inch long, with a head like a nail, which lies on the cheek, where it passes unnoticed like a black patch. The constant presence of this instrument causes the duct to dilate, so that the tears flow by its side. It should be occasionally cleaned, and then be replaced; and it causes so much comfort, and the duct is so likely to close if it be left off, that it generally is worn for life.

SECTION III.—OF INFLAMMATION OF THE EYE GENERALLY, AND OF THE DISEASES OF THE CONJUNCTIVA.

1. Common acute Ophthalmia consists of inflammation of the conjunctiva. *Symptoms.*—Smarting, heat, stiffness, and dryness of the eye, with a feeling as if dust had got into it; the conjunctiva of a bright scarlet redness; the redness superficial, so that the enlarged vessels can be moved by pulling the eyelids; slight intolerance of light and lachrymation on exposure of the eye, and more or less headache and fever. *Causes.*—Slight local irritation, disorder of the digestive organs, or cold and damp.

Catarrhal Ophthalmia is a variety of this inflammation, caused by cold and damp, and attended with a thin mucous discharge,—which in severe cases becomes thick, purulent, and doubtless contagious.

Treatment.—A few leeches, an emetic, a dose of calomel with a little tartar emetic, followed by a black draught; the eye to be frequently bathed with dec. papav., or F. 37, or the weaker forms of F. 36, lukewarm or cold, according to the patient's choice; the edges of the eyelids to be smeared at night with fresh lard, and with weak ung. hydr. nit. ox. after the first day or two; a green shade to be worn over *both* eyes, whilst there is much intolerance of light; but the patient not to be confined to the house too long, unless the case is very severe, or the weather bad. In the catar-

rhal variety, a large drop of solution of arg. nit. (gr. ii—iv ad ℥i) may be put into the eye twice or thrice a day. If the patient be plethoric, and there be much pain, headache, and fever, bleeding and calomel in repeated doses will be required.

II. INFLAMMATION OF THE WHOLE EYE is a rare disease. It may be caused by severe injuries, or be a consequence of the common ophthalmia if neglected. There are great redness and swelling of the conjunctiva; pain, both burning, aching, and throbbing; intolerance of light, dimness of vision, and severe headache and fever. It may lead to suppuration of the whole globe; or to opacity of the cornea and lens, adhesions of the iris, insensibility of the retina, and atrophy of the whole globe. The treatment must be decidedly antiphlogistic; and if it be clear that suppuration of the whole globe has occurred—there being rigors—the cornea yellow and distended, and excruciating pain unrelieved by further depletion, a free incision should be made into the cornea to let the matter escape.

III. CHRONIC INFLAMMATION OF THE CONJUNCTIVA may be a sequel of the acute, or may be caused by some local irritation, (inverted eyelashes, &c.,) or by some derangement of the health. *Treatment.*—(1.) All local sources of irritation should be removed. (2.) The general health should be amended, in the same manner as directed for chronic inflammation generally, (vide p. 40.) (3.) The distended capillaries must be unloaded by occasional local bleedings, and be excited to contract by stimulants and astringents, such as the various collyria in F. 36 and 37, which should be used with an eye-cup; or the vinum opii, of which a few drops may be put into the eye daily. The edges of the eyelids should be smeared every night with weak ung. hydr. nit., and blisters should be applied behind the ears.

IV. PURULENT OPHTHALMIA OF CHILDREN occurs a few days after birth. *Symptoms.*—At first the edges of the lids appear red, and glued together; their internal surface is red and villous, and the eye is kept closed. Then the conjunctiva of the globe becomes intensely scarlet and much swelled, (the swelling often causing eversion of the lids;) it secretes a thick, purulent discharge, and the child is very restless and feverish. If neglected, this disease may occasion opacity or ulceration, more rarely sloughing of the cornea; but it generally yields to early and proper treatment. *Causes.*—Exposure to cold and damp, improper food, the contact of diseased secretions from the vagina during birth, or neglect in washing the natural cheesy secretion of the skin away from the eyes. *Treatment.*—The bowels should be cleared with a grain of calomel or hydr. c. creta, followed by a little castor oil or rhubarb;—a leech should be applied to the upper eyelid; if both eyes are affected, a *small* leech may be applied to each; the insides of the lids may be scarified; the discharge should be washed out three or four times a day with F. 37 or 36; and the nitrate

of silver should be applied once a day, either in the form of solution, (gr. iv ad ℥i,) or of ointment, (gr. x ad 3i). If the cornea ulcerate or slough, or if the discharge be obstinate, tonics are required, (quin. sulph. gr.ß.—vel. ext. cinchon. gr. iii ex lacte,) and the astringent collyria should be persevered in.

V. Purulent Ophthalmia in Adults.—(*Contagious* or *Egyptian Ophthalmia.*) *Symptoms.*—Stiffness, itching, and watering of the eye, with a sense of dust in it, and slight swelling of the lids, which stick together during sleep,—followed by great redness and swelling of the conjunctiva, whose surface becomes villous or granular; profuse purulent discharge; severe burning pain, with a sense of fulness or distension of the eye; headache and fever. Swelling of the conjunctiva around the cornea is termed *chemosis.* It depends on infiltration of the cellular tissue between it and the sclerotic; and it always terminates in an abrupt ring at the margin of the cornea, because the conjunctiva is firmly adherent there. *Consequences.*—This affection may lead to ulceration or opacity (rarely sloughing) of the cornea, or to adhesions of the iris, or to impairment of vision, from extension of inflammation to the internal parts of the globe. *Causes.*—It may be produced by severe local irritation, as the introduction of lime, for instance. It is endemic in Egypt, owing to the glaring sunshine and the particles of sand with which the air is loaded; but when once produced by any cause whatever, it is most undoubtedly *contagious,*—the observations which were made respecting diseased secretions from the genitals being equally applicable to those of the eye. (p. 159 and 161.)

VI. Gonorrhœal Ophthalmia is the most violent form of purulent conjunctivitis. The *symptoms* are essentially the same as those of the last species; but the chemosis is greater, the discharge thicker and more abundant, the constitutional disturbance more severe, and the cornea much more apt to slough. *Cause.*—This disease arises without doubt from the application of gonorrhœal matter to the eye. *Prognosis.*—This is very unfavourable. The sight of the affected eye will either be lost, or excessively impaired, unless treatment be very early and efficacious. *Consequences.*—The most frequent and detrimental is *sloughing of the cornea,* which is supposed to be caused by the constriction of its vessels by the chemosis. The sloughing generally occurs quite suddenly; the cornea may be clear in the morning—cloudy and flaccid in the evening—and by the next morning it may have burst;—and this change may supervene at any time from the second day of the disease till the last. If the slough be very small, the iris may protrude, and close the aperture;—imperfect sight remaining, but generally the major part of the cornea perishes.

Treatment.—The indications are, (1) to mitigate inflammation; (2) to alter the action of the inflamed part by certain stimulants.

1. A full bleeding should be performed from the arm or jugular

vein;—the bowels should be well cleared;—calomel and antimony (F. 6) should be administered in repeated doses, and Dover's powder at bedtime to allay pain. The patient must be kept in bed in a darkened room, with the head elevated, and on low diet. The best local means of abstracting blood is *scarification* of the conjunctiva. This is usually performed by making an incision with a rounded lancet along the inner surface of the eyelids, or on the tumefied conjunctiva between the lid and the globe. Mr. Tyrrell, however, has proposed a new and more efficacious plan. He directs two or more incisions to be made completely through the *chemosis*, from the edge of the cornea to the outside of the eye; by which means the tension of the conjunctiva is removed without cutting through the vessels that supply the cornea. *Leeches* should be repeatedly applied; the forenoon is the best time, in order to anticipate the exacerbation of pain which generally supervenes in the evening. The eye may be covered with a poultice, or with poppy fomentation, or with any hot or cold application that is agreeable. *Cold affusion* of the head has been much recommended when it is heavy and painful. *Blisters* should be applied to the neck, or behind the ears, after the first day.

2. To fulfil the second indication, a small quantity of liq. plumbi diac., or of ol. terebinth., is introduced between the lids by some, but the nitrate of silver is commonly preferred. It may be used in the form of solution, (gr. iv—x ad ℥i,) or of ointment. Guthrie recommends an ointment of arg. nit. gr. x, liq. plumbi ♏ xv, adipis ℥i—the nitrate to be very finely powdered, and the lard well washed. A piece of ointment the size of a pea, or a large drop of the solution on a hair pencil, should be thoroughly diffused between the lids and globe twice a day at least. The ointment should turn the membrane white. Before using these applications, and several other times in the day, the eye should be thoroughly but gently syringed with a milder lotion, to free it from the discharge, (Mackenzie's F. 37, or the weaker forms of F. 36,) and the edges of the lids should be smeared at night with weak ung. hyd. nit. ox. If the strength becomes impaired, and the cornea has given way, tonics (especially F. 1) or sarsaparilla should be administered; which, with repeated blisters and a continuance of the astringent applications, are the measures for removing the reliques of the disease.

VII. Scrofulous Ophthalmia (*phlyctenular ophthalmia*) generally attacks children under eight years of age.

Symptoms.—Extreme intolerance of light,—the lids spasmodically closed,—the head turned obstinately away from the light,—no general vascularity of the conjunctiva, but one or two enlarged vessels running towards the cornea, and terminating at one

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* Med. Chir. Trans., vol. xxi. part 2.

or more *phlyctenulæ*, or small opaque pimples, (or sometimes pustules,) on the cornea, either of which may lead to opacity or ulceration of that part. *Treatment.* (1) The alimentary canal should be cleared by an emetic and dose of calomel and jalap, and after feverishness has subsided, recourse must be had to the various combinations of tonics, aperients, and antacids, and to the other general remedies directed for scrofula, (p. 183.) Quinine is particularly recommended by Mackenzie. (2) *Both* eyes should be protected with a shade. The lotion of arg. nit. (gr. iv ad ℥j) or the vin. opii should be dropped into the eye once a day; the enlarged conjunctival vessels should be cut across, and the insides of the lids be scarified if turgid,—blisters should be applied behind the ears, or to the nape of the neck—or the tartar emetic ointment if they fail;—the great intolerance of light is sometimes relieved by cold lotions, such as poppy decoction with a little spirit, or water to which a very little vinegar, or spirit, or nitric æther, has been added, or F. 37, or the white of egg curdled with alum;—but warm poultices, or dec. papav. vel anthemid., or exposing the eye to the vapour of warm water, or of laudanum or sp. camph., which may be put into a teacup and be held in warm water—or warm lotions of ext. belladon. vel hyoscyami (℈j ad ℥j aquæ,) or those extracts smeared on the brow, are of more efficacy.

VIII. Granular Conjunctiva—a thick, rough, fleshy state of that membrane, (especially the palpebral,) is a frequent consequence of severe and long-continued ophthalmia. It causes great pain and disturbance to the motions of the eye, and renders the cornea opaque by its friction. *Treatment.*—The thickened part should first be scarified, then (waiting a day) it should be rubbed with lunar caustic or sulphate of copper, or be washed with strong astringent collyria every day or two,—the ung. hyd. nit. oxyd. should be smeared at night on the edges of the lids,—blisters should be applied behind the ears, and the general health be attended to.

IX. Pterygium is a peculiar alteration of the conjunctiva, a triangular portion of which, with the apex towards the cornea, becomes thickened and elevated,—sometimes transparent, sometimes red and fleshy. It may spread over the cornea and obstruct vision. *Treatment.*—If it does not disappear under the use of vin. opii or caustic lotion, it must be completely scarified across, and if that fail, it must be seized with a hook and be extirpated.

SECTION IV.—OF THE DISEASES OF THE CORNEA.

I. Acute Corneitis is generally a consequence of neglected injury. The part becomes red and opake,—the sclerotic around highly vascular,—and ulceration of the cornea, or suppuration between its layers, or into the anterior chamber, may ensue. Local

and general bleeding, mercury and antimony, and fomentations, are the remedies. Stimulants are prejudicial.

II. Scrofulous Corneitis most frequently occurs between the ages of eight and eighteen. *Symptoms.*—The cornea opaque, rough and red, and unusually prominent,—the surrounding sclerotic also red,—pain and intolerance of light are generally trivial,—there is considerable tendency to inflammation of the iris and retina,—the pulse is frequent and the skin dry. *Treatment.*—For the acute, leeches, emetics, purgatives, calomel and antimony, fomentations, and belladonna smeared on the eyebrow. For the chronic, quinine should be perseveringly administered; together with blisters, and remedies to regulate the secretions. The vin. opii, and ung. hydr. nit. ox. to the eyelids are almost the only local applications admissible.

III. Adhesive Inflammation of the cornea, with effusion of fibrine between its layers, or between it and the conjunctiva, produces various degrees of Opacity, which when slight and diffused is called *nebula*;—when denser and of a firmer aspect, *albugo*. Sometimes the albugo becomes vascular, and one or more vessels run to it from the circumference of the eye. These affections may be a result of any form of ophthalmia, but most frequently of the scrofulous. *Treatment.*—(1) All sources of irritation about the eye or lids, (inverted hairs, granular conjunctiva, &c.) must be removed, and any existing degree of inflammation be counteracted by proper measures. Then (2) absorption of the lymph may be promoted by counter-irritants, alteratives, and the application of stimulants;—especially caustic lotion (gr. ii—x ad ℥j) or hydr. bichlor. gr. i—ii ad aq. ℥j;—vin. opii;—ung. hydr. nit. ox.;—or a powder composed of hydr. nit. ox. ℥j, sacchari ℥j, very finely powdered, a little of it to be blown into the eye. Whichever is selected should be applied regularly, and should not excite long-continued pain or active inflammation. Any enlarged vessels running from the circumference of the eye to the opacity should be divided.

IV. Leucoma signifies an opaque cicatrix of the cornea. If recent, it may be partially removed by the measures just indicated.

V. Onyx—suppuration between the layers of the cornea, a result of acute ophthalmia, derives its name from its resemblance in shape to the white spot at the root of the finger nail. It mostly disappears with proper antiphlogistic treatment. If it extend very fast, it may be necessary to puncture the external layers of the cornea to relieve the great pain, but the sight will be lost.

VI. Ulcers of the cornea are a frequent consequence of the *phlyctenulæ* of scrofulous ophthalmia, (in which case they are deep, and tend to perforate the cornea,) or they may arise from mechanical injury, or any form of conjunctival inflammation. *Treatment.*—(1) Any existing inflammation must be remedied by suitable measures; counter-irritation should be practised, and if the patient be meagre and cachectic, (as is generally the case,) the strength must

be supported by tonics. (2.) The ulcer should be well touched once a day with solid nitrate of silver, which will form an eschar on its surface, and protect it from irritation.

VII. STAPHYLOMA signifies a protrusion on the anterior surface of the eye. 1. *Staphyloma iridis* is a protrusion of the iris, owing to perforating ulcers or wounds of the cornea. The protruded part should be punctured, or be snipped off if large, and be subsequently touched with arg. nit. 2. *Corneal staphyloma*—a portion or the whole of the cornea opaque, white, and prominent, the iris adhering to it—a consequence of severe inflammation. If *partial*, the butter of antimony may be applied to the apex of the staphyloma, so that the inflammation excited may thicken the cornea, and enable it to resist further protrusion. The caustic should be well washed off with milk before the lids are closed. If *general*, the staphyloma should be shaved off, for, as it is not covered by the eyelids, it is a source of constant irritation and pain.

VIII. CONICAL CORNEA—the part gradually becoming thin and exceedingly convex, but transparent—causes almost total deprivation of vision, (which, however, can be partially aided by looking through a minute aperture in a piece of blackened wood,)—and is incurable, although its progress may be retarded by tonics and counter-irritants.

CAUTION.—If the acetate of lead is used as a collyrium when there is any abrasion of the conjunctiva or cornea, a white precipitate is formed, which may become fixed in the cicatrix as a dense white spot. The film may, however, sometimes be removed by a needle. The nitrate of silver, if applied too long, is apt to turn the conjunctiva to a deep olive hue.

SECTION V.—DISEASES OF THE SCLEROTIC.

I. ACUTE INFLAMMATION (*rheumatic ophthalmia*) is known by redness of the sclerotic, cloudiness of the cornea, and consequent dimness of vision, no great intolerance of light, severe stinging pain of the eye, and aching of the bones around, (which is greatly aggravated at night,) and fever. It may be caused by cold, or, like other fibrous (or rheumatic) inflammations, may occur in conjunction with gonorrhœa, (p. 158 and 160.) It may lead to opacity of the cornea, or to iritis. *Diagnosis.*—It is known from inflammation of the conjunctiva by the redness being deeper seated, and of a pale pink colour, and by the vessels running in *straight* lines on the sclerotic, and terminating at a red circle around the cornea,—whereas the vessels of the conjunctiva are scarlet and superficial, and can be moved about. *Treatment.*—Bleeding and leeches, purgatives, calomel, and opium, till the gums begin to be affected,—friction of the forehead with extract of belladonna dissolved in warm laudanum (℥j ad ℥j) every afternoon;—warm pediluvia, when the pulse is reduced by bleeding,—blisters behind the ears,—

Dover's powder at bedtime,—and subsequently tonics, especially F. 31. The only allowable application to the eye itself is the vin. opii in the last stage.

II. CATARRHO-RHEUMATIC OPHTHALMIA is a combination of inflammation of the sclerotic with that of the conjunctiva. Roughness and sense of dust in the eye,—muco-purulent discharge and superficial scarlet redness are combined with the deeper-seated, straight-lined redness, and with the zone around the cornea, and fits of nocturnal aching that characterise inflammation of the sclerotic. This disease is very apt to lead to onyx, or to ulceration of the cornea. *Treatment.*—Nitrate of silver, astringent collyria, scarifications, ung. hydr. nit. ox., and the other topical applications for conjunctival inflammation, must be used in addition to bleeding, calomel, and opium, and the other remedies prescribed for simple inflammation of the sclerotic.

SECTION VI.—INFLAMMATION OF THE ANTERIOR CHAMBER, OR AQUO-CAPSULITIS.

This affection is generally a consequence of some other form of ophthalmia, but it may occur by itself. *Symptoms.*—The iris dull, the cornea mottled, the eye very tense and painful, and fever. The most peculiar consequence of this disease, whether primary or consecutive of some other inflammation of the eye, is *hypopion*; *i. e.* an effusion of an albuminous (or perhaps purulent) fluid into the anterior chamber. It is distinguished from *onyx* by the white fluid moving in different positions of the head, and by its upper margin being straight, not convex. *Treatment.*—Calomel and opium, and belladonna, and the general treatment of iritis, will remove the inflammation, and cause absorption of the hypopion.

SECTION VII.—OF THE DISEASES OF THE IRIS.

I. IRITIS.—*Symptoms.*—Intolerance of light, dimness of sight, pink redness of the sclerotic, a red circle around the cornea, and pain,—which is sometimes severe and burning,—sometimes seated in the forehead and temple,—and sometimes remarkably absent even in acute cases. In severe cases, the conjunctiva also becomes vascular. The fibrous structure of the iris appears confused, and it becomes dark and muddy, with perhaps a reddish tinge. In the next stage lymph is effused;—sometimes in the form of a thin layer, causing the surface to appear rusty and villous,—sometimes in small nodules;—sometimes the pupil (which from the first is contracted and irregular) is filled with a film of it,—sometimes it is poured out in such abundance as to fill the whole cavity of the aqueous tumour. *Causes.*—Iritis may be caused by

injuries, or by over-exertion of the eye; but it more frequently depends on constitutional taint, syphilis, or gout. *Prognosis.*—Favourable, if the disease is recent and confined to the iris, although the impairment of vision be considerable;—but doubtful, if it be of long duration (*i. e.* more than a fortnight;)—if there be much deep-seated pain, and especially if there be great effusion of lymph behind the iris. *Varieties.*—(1) It may be acute or chronic. (2) Venereal iritis is the most frequent variety. It is generally attended with effusion of lymph in little nodules of a reddish or brown colour, which cause the pupil to become angular. There is great pain at night, and but little in the day, and other secondary venereal affections are usually present at the same time. (3) Arthritic iritis (gouty or rheumatic) is known by the general character and previous diseases of the patient. There is generally great pain in the neighbourhood of the eye,—the vascular circle around the cornea is dull, and does not quite touch the latter, but is separated from it by a narrow white interval. (4) Scrofulous iritis is rarely a *primary* affection, but generally a consequence of neglected strumous ophthalmia. *Treatment.*—The indications are, 1, to subdue inflammation; 2, to arrest the effusion of lymph, and cause absorption of what is already effused; 3, to preserve the pupil entire. 1st. If the patient be strong, and the disease acute, with much pain and fever, bleeding should be performed, and be repeated according to the pulse. In chronic cases, cupping will be preferable. The bowels must be well cleared, and the antiphlogistic regimen generally be observed. 2ndly. Mercury must be given so as to affect the system speedily—gr. ii—iv of calomel with gr. ¼—½ of opium being administered at intervals of from four to eight hours. And when the mouth becomes sore, the lymph will generally be found to break up and gradually disappear. 3dly. The pupil should be kept well dilated by means of extract of belladonna, a thick solution of which should be painted on the eyelids, or dropped into the eye. Stramonium or hyoscyamus may be substituted if preferred.

Turpentine is a valuable remedy in iritis. It may be given in large doses (F. 18) to act upon the bowels, during the administration of mercury, or in small doses (℥i) three times a day, so as to act on the kidneys, if from any cause (such as great debility, previous severe salivation) mercury is deemed inadmissible. Blisters are injurious except in chronic cases, and the only local applications of any use (except the belladonna) are poppy fomentations to soothe the pain.

In gouty iritis, calomel is only to be used so as to evacuate the bowels and amend the secretions, but not to affect the system; but colchicum in doses of ♏xx of the wine, with turpentine purgatives, F. 18, must be used instead. Bleeding, local and general, must be employed as the strength permits, and pediluvia containing mustard should be used every night.

II. SYNECHIA POSTERIOR—adhesion of the *uvea* to the capsule of the lens;—SYNECHIA ANTERIOR—adhesion of the iris to the cornea;—and ATRESIA IRIDIS, or closure of the pupil—three consequences of iritis—may be partially removed by mercury if recent, but are irremedial if the lymph has become organised. But belladonna should always be applied; because if a very small portion of the pupil is by chance inadherent, it may be dilated so as to afford a very useful degree of vision.

III. MYOSIS—a preternaturally contracted pupil—is often met with in persons accustomed to look at minute objects. MYDRIASIS—a preternaturally dilated pupil—generally depends on insensibility of the optic nerve. But if the nerve be sound, vision may be assisted by wearing a pair of spectacles having, instead of glasses, two pieces of pasteboard blackened within, and perforated with an aperture of the natural size of the pupil.

IV. ARTIFICIAL PUPIL.—When the sight is obstructed by a closure of the pupil, with or without adhesion of the iris to the cornea or lens, or by opacity of the centre of the cornea, it may be expedient to make a new aperture in the iris. But before resorting to any such operation, it must be ascertained, 1st, whether the adhesions of the iris cannot be removed by mercury or belladonna,—or opacity of the cornea by external applications; 2ndly, that the retina is perfectly sound; 3dly, that all tendency to inflammation (syphilitic or otherwise) has ceased. It is not advisable to operate if one eye be quite sound;—and supposing one eye to be irrecoverably lost, it is not advisable to form an artificial pupil in the other, provided the patient find his way about with it. The new pupil should be made large, because it will always contract somewhat afterwards. If it cannot be made in the middle, it is better on the inside than on the outer side, and better below than above. *Operations.*—There are three methods of operating. 1. *Coretomia*, or *incision*. This may be done by introducing a cutting needle behind the iris, as in the operation for couching;—and then turning it forwards so as to divide the iris. Or by making a small incision in the cornea, (in the same manner as for extraction of cataract, but about half the size,) through which a fine pair of scissors (Maunoir's) are introduced, and a double slit made with them in the iris, shaped like a V. The intermediate flap shrinks in a few days, and leaves a circular aperture. 2. *Corectomia*, or *excision*. An incision three lines long is made near the margin of the cornea;—the iris, prolapses, (or is drawn out with a small hook,) and then a small portion of it is snipped out. 3. *Coredialysis*, or *detachment* of the iris from the ciliary ligament, may be performed by a small hook introduced through an incision in the cornea. Of these three methods, that by excision is the best.

SECTION VIII.—OF THE DISEASES OF THE CRYSTALLINE LENS.

I. INFLAMMATION OF THE CAPSULE is a very rare affection, always chronic. Vision is confused,—objects looking as if they were seen through a fine gauze. On examining the eye with a strong lens in a good light, and the pupil being well dilated with belladonna, a number of minute red vessels are seen in the pupil. If the anterior capsule be affected, the vessels form a circular wreath of vascular arches with the centre clear;—if it be the posterior capsule, they are arborescent and central. The iris is always slightly discoloured and sluggish. *Treatment.*—Local or general bleeding;—mercury, counter-irritation, change of air, and alteratives.

II.—OF CATARACT.

DEFINITION.—An opacity of the crystalline lens or its capsule.

SYMPTOMS.—Before examining any patient with suspected cataract, the pupil should be dilated with belladonna, and then if there be cataract, there will be seen an opaque body of a gray, bluish, white, or amber colour behind the pupil, perhaps obstructing it completely. The patient gives as his history, that his vision has become gradually impaired, that objects appear as if surrounded with a mist, or as if a cloud was interposed between them and the eye, and that the sight is better in the evening, or when the back is turned to the window, or after the application of belladonna,—obviously because the pupil being dilated admits more light. In the most confirmed cases, the patient is able to distinguish day from night.

PATHOLOGY.—Cataract (especially of the capsule) is sometimes attributable to inflammation, and may be caused in a short space of time by wounds or other injuries of the lens. But the ordinary cataract of the old seems to be a mere effect of impaired nutrition.

DIAGNOSIS will be spoken of under Amaurosis.

VARIETIES.—1. *Hard* cataract. The lens shrunk and hard, amber yellow in the centre, gray towards the circumference;—generally occurring in old people. There is an appreciable interval between the lens and iris. 2. *Radiated* cataract—the opacity commencing in streaks at the circumference, which slowly converge towards the centre. 3. *Soft* cataract,—the lens of the consistence of soft cheese or cream, and of a gray or bluish, or pure white colour, without any amber tint. This mostly occurs in the young, and causes a greater degree of blindness than the hard variety,—and the lens being swelled projects against the iris, and interferes with its motions. 4. *Capsular* cataract. Opacity of the capsule occurs in spots or streaks, with less opaque intervals. It is not

unfrequently the result of a slow inflammation, which may be accompanied with pain in the eye, and signs of congestion in the head;—or of inflammation, produced by direct injury to the lens or its capsule;—or of inflammation extending from the iris or conjunctiva. Opacity of the *anterior* portion may be seen immediately behind the iris, and has a glistening, chalky, or pearly white appearance. That of the *posterior* appears at some little distance behind the pupil, and presents a concave striated surface, of a dull yellowish appearance. 5. *Capsulo-lenticular* cataract is very common,—in fact, opacity of the capsule is always followed by opacity of the lens.

TREATMENT.—The cataract must be removed by operation. No other treatment is of any avail. It is, however, a general rule, not to operate for cataract if it affect one eye only. It is another rule not to operate till the cataract is *mature*;—that is, not whilst the degree of vision is sufficient for ordinary purposes; more particularly if the patient be very old and feeble, or if one eye be already lost;—because under these circumstances a failure of the operation would entail utter blindness. Therefore the patient should dilate the pupil with belladonna when he wishes to see particularly well, and defer the operation till, despite of that aid, his blindness is complete.

Prognosis.—This will be favourable if the patient is in good health, of a spare frame, and temperate habits;—if the iris move freely, and if the retina seem perfectly sensible to light. On the other hand, it will be doubtful if there be signs of vascular disturbance in the eye or head—if the iris be motionless or altered in colour, or if it be adherent to the capsule;—or if the cataract is complicated with amaurosis, synchysis, or glaucoma.

Preparation.—Before operating, the patient should be put into as perfect a state of health as possible. The bowels should be cleared, the secretions be regulated, and bleeding and low diet be enjoined if the habit be inflammatory.

There are three methods of operating;—extraction, depression, (or *couching*,) and the operation for causing absorption.

1. EXTRACTION.—This operation effectually removes the cataract, but in the event of a failure sight is almost irretrievably lost. It is best adapted for hard cataracts in elderly people. But it should not be attempted, 1st, if the patient be very old and feeble, in case the wound of the cornea might not unite. 2ndly, If the anterior chamber be very small and the cornea very flat, so that a sufficiently large opening cannot be made in it. 3rdly, If the iris adhere much to the cornea, or if the cataract be large and push it forwards, or if the pupil be habitually contracted. 4thly, If the eye be sunken, or if the fissure of the lids be preternaturally small. 5thly, If the eyes are very unsteady, or if the patient be unmanageable in consequence of infancy or idiocy. One eye only should be operated on at a time, the other being kept as a reserve.

Preliminaries.—The patient should be seated in a low chair with a high back, opposite a window that admits a good clear light, but no sunshine, and should be disposed somewhat obliquely, so that the operator may not see the image of the window on the cornea. The surgeon should sit immediately before him on a higher chair; and should have a stool, so as to raise one knee to a proper height for steadying the elbow of the operating hand upon it. Behind the patient an assistant should stand, whose duties are, 1st, to steady the head against the back of the chair, or against his own breast. 2ndly, To elevate the upper eyelid, and fix it against the margin of the orbit, with one forefinger. 3rdly, To drop it at a preconcerted signal from the surgeon.

Operation.—The surgeon, 1st, depresses the lower eyelid, and steadies the globe with the fore and middle fingers of one hand, but without exerting any pressure on it. He particularly endeavours to prevent it from rolling inwards during the operation. 2ndly, Holding the *cornea-knife** like a pen, (in the right hand for the left eye, and *vice versâ*,) and resting the other fingers on the patient's cheek, he touches the cornea once or twice with the flat part of the blade, in order to take off the patient's alarm. 3rdly, He *punctures the cornea* close to its outer margin, pushing the point of the blade perpendicularly towards the iris, and not obliquely; otherwise it would pass between the laminæ of the cornea instead of entering the anterior chamber. 4thly, He must push it steadily across parallel to the iris, till it cuts its way out, making a semicircular flap of the lower half of the cornea; immediately upon which the eyelid should be dropped. 5thly, Waiting a few seconds, the surgeon takes a *curette*,—introduces the pointed end with the convexity upwards, and freely lacerates the capsule with it;—and withdraws it with the convexity downwards. 6thly, He makes *very gentle* pressure on the under part of the globe, and on the upper eyelid, till the lens rises through the pupil and escapes. The eye should be opened after a minute or two, to see that the flap of the cornea is rightly adjusted, and that the iris is not prolapsed;—if it be, the eyes should be exposed to a bright light, so as to make the pupil contract, and the prolapsed portion should be gently pressed upon with the spoon of the curette. Then the operation is finished.

Varieties.—Some persons make a flap of the upper instead of the lower half of the cornea. The patient lies on a couch; the

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* The knife called Beer's is most used. It has a triangular blade;—the point sharp;—the back straight and blunt, the edge slanting obliquely, and the blade increasing in breadth and thickness as it approaches the handle. The advantages of this shape are, that it fills up the incision which it makes, and prevents the escape of the aqueous humour;—and that the flap of the cornea is made by one simple motion, that is, by pushing the knife inwards.

surgeon sits behind him, and elevates the lid and fixes the globe with one hand. "The advantages of this operation," says Mr. Lawrence, "are, that the operator has a more complete control over the globe; he can fix it very perfectly; that the aqueous humour does not escape so readily, and consequently that the section of the cornea is more readily accomplished; that there is less chance of prolapsus iridis; and that the upper lid keeps the flap of the cornea in exact apposition."

Complications.—(1.) If the point of the knife should be completely entangled in the iris, the best plan is, to withdraw the instrument, heal the wound, and repeat the operation afterwards. If, however, a little bit of it should get under the edge of the knife, when the section is nearly complete, the operation may be finished with a small curved knife. (2.) If the opening of the cornea is not large enough, it must be enlarged with a similar knife. (3.) If a portion of the lens remain behind, it should be left to be absorbed—unless it has passed into the anterior chamber, and can be removed very easily indeed. (4.) If the vitreous humour seem disposed to escape, the cataract should be hooked out with the curette. But the escape of a little is of no consequencc.

After Treatment.—The patient should be put to bed, with the shoulders raised, the room darkened, and with a very soft linen rag over both eyes; which may be wetted if agreeable. No food should be allowed which requires much mastication, and the bowels should be kept open. If he goes on comfortably, the eyelid may be raised on the fifth day, and then if there be no prolapse of the iris, and the cornea be united, he may get up occasionally, wearing a shade, sitting in a darkened room, and walking about a little. After a fortnight the eye may be opened in a weak light, and be gradually brought into use. But inasmuch as it remains weak and irritable, the patient must take the greatest care to avoid exposure to cold, excess in diet, over-exertion of the eye, or exposure of it to too strong a light. Gray spectacles are the best protectors against wind, or too glaring a light. The patient will require convex spectacles for exact vision, but they must be used very sparingly at first.

If pain in the head or in the eye be complained of—or if the patient have not been properly lowered or prepared, bleeding should be freely performed in the evening of the operation, and should be freely repeated. And if it persist, mercury and belladonna should be used likewise, as for iritis. *Prolapsus iridis* must be treated like the *staphyloma iridis*, p. 277.

II. Depression is adapted to those cases of hard cataract, of which the extraction would be unadvisable, for reasons mentioned in a preceding page, (282.) The preparation of the patient, his position during the operation, as well as that of the surgeon, and the duties of the assistant, are the same as required for the opera-

tion of extraction. The pupil should be dilated with belladonna.

Operations.—(1.) A couching-needle is passed through the outer side of the sclerotic, about two lines behind the margin of the cornea, and a little above the transverse diameter of the eye, so as to avoid the long ciliary artery. It is carried upwards and forwards in front of the cataract, and then is steadily and gently pressed upon it, so as to carry it downwards and backwards out of sight. It should be held for a few moments to fix it, then should be lifted up, and if the lens rise also, it must be again depressed for a short time. Then the needle is withdrawn. (2.) According to *Scarpa's plan*, a curved needle is used instead of a straight one. It is to be introduced with its convexity forwards, and the lens is to be depressed in the manner just described—but before withdrawing the needle, its point is to be turned forwards, and made to lacerate the capsule freely

(3.) *King's Operation.*—A curved needle is passed perpendicularly through the sclerotic, as low down as possible;—and if the patient's eye is directed upwards and inwards, it can be made to enter almost perpendicularly below the centre of the cornea and one eighth of an inch from its margin. It should then be passed onwards with a slight rotatory motion to the pupil, having its convexity forwards, *i e.* towards the back of the iris. When it reaches the pupil, these rotations are to be increased, so that the point may cut the anterior capsule into small pieces. The needle is then slowly withdrawn, and the lens follows it, so that it is left at the bottom of the eye close to the puncture made by the needle. If the lens should not immediately follow the needle downwards, the latter is to be stuck into it again.* (4.) The method of *reclination*, which consists of turning the lens backwards from an upright to an horizontal position, is not much in vogue.

III. The Operation for producing Absorption is very easily performed, and excites very little inflammation. Its disadvantages are, that it requires to be repeated, and that the cure is very slow, occupying several weeks or months. It is well adapted for soft cataracts, especially the congenital.

Operations.—(1.) The needle may be introduced behind the iris in the same manner as for depression. Then the anterior layer of the capsule is to be freely divided, and the needle, having been passed once or twice through the substance of the lens, is to be withdrawn. Care must be taken not to dislocate the lens in this first operation. The cataract will be more or less dissolved by the aqueous humour, and be absorbed. After the lapse of a few weeks, if any part of it remain, the operation may be repeated, the cap-

* Lond. Med. Gaz., vol. xxii. pp. 701 and 1009.

sule may be lacerated more extensively, and the lens be cut up into fragments, which, if perfectly *soft*, may be pushed through the pupil into the anterior chamber, where absorption is more brisk. This operation may be repeated again and again if necessary. If a hard fragment be pushed into the anterior chamber, it may probably excite great inflammation, and require to be removed by operation. (2.) Some recommend the needle to be introduced through the cornea, an operation styled *keratonyxis*. The pupil must be well dilated. Then the needle is passed through the cornea about an eighth of an inch from its margin, and is made to lacerate the capsule to the extent of the pupil. It should be of such a shape as to prevent the escape of the aqueous humour. This method is liable to induce iritis, and does not enable the surgeon to act upon the body of the lens. It should therefore be merely employed as a *first* operation, to divide the capsule.

Operations on Infants.—Congenital cataracts should be operated on early—within the first year if possible, lest the eye, which when born blind habitually oscillates from side to side, may never acquire the power of being directed to any particular object. The pupil being well dilated, the child should be placed on a table—the head on a pillow, and rather hanging over it—one assistant holding the legs and trunk, a second the arms and chest, a third fixing the head between his two hands, and a fourth, depressing the *lower* eyelid with one hand, and steadying the chin with the other. The operator then, seated behind the patient, performs the operation for absorption as before described; at the same time elevates the upper lid, and fixes the globe with an *elevator*. Care must be taken not to dislocate the lens, and not to wound the posterior capsule or vitreous humour. This operation on children, and in fact on persons under twenty, generally excites so little inflammation, that both eyes may be operated on at once;—but the bowels must be kept open, and leeches should be applied if there be pain.

Capsular Cataract.—When congenital cataract is left to itself, the lens becomes absorbed, and the capsule remains tough and opaque; or sometimes an opaque capsule is left, or it becomes opaque after one of the operations for cataract. (1.) A needle with cutting edges may be introduced, as for depression; and then may be made to cut crucially through the opaque capsule, which then may shrink and leave the pupil clear. (2.) The upper part of the capsule, for four fifths of its circumference, may be detached by the needle from the ciliary processes, and then be pushed down below the pupil. (3.) If no other plan succeed in removing a detached piece of capsule, an opening may be made in the cornea, through which it may be extracted by means of a small hook or forceps. Mr. Middlemore has recently proposed a plan for removing such bodies through the sclerotic.*

* Med. Gaz., April 7, 1838.

SECTION IX.—OF THE DISEASES OF THE VITREOUS HUMOUR.

1. GLAUCOMA is a slow inflammatory affection of the vitreous humour and deep-seated tunics of the eye, generally occurring to the gouty and intemperate. *Symptoms.*—Severe pain in the head and eyebrow—gradually increasing dimness of vision—and a greenish deep-seated discoloration of the pupil; it sometimes appearing as though there were a piece of metal at the bottom of the eye. The pupil is mostly dilated, and moves sluggishly—and the lens after a time becomes opaque. *Diagnosis.*—Glaucoma is known from cataract by the greenish tint of the pupil, and by the disappearance of the discoloration when the pupil is viewed laterally or obliquely. The loss of vision is not proportionate to the discoloration;—and the sight is best in a strong light. *Treatment.*—Cupping, purging, low or moderate diet, a course of mercury, or of colchicum if the pain be severe, and rest of the eye, will, if persevered in, remove the headache and other signs of congestion, and retard the disease, although they may not cure it.

II. SYNCHYSIS is an unnatural fluidity of the vitreous humour, which may or may not be also discoloured. The eye feels soft and flaccid, the iris is peculiarly tremulous, shaking backwards and forwards like a rag in a bottle of water, the retina becomes insensible, and the lens opaque. This affection is sometimes the result of wounds, and sometimes comes on without obvious cause. It is supposed to depend on a slow inflammation. It is irremediable.

III. DROPSY of the vitreous humour causes enlargement of the globe, with loss of sight and constant excruciating pain, only to be relieved by puncturing the sclerotic with a needle.

SECTION X.—DISEASES OF THE CHOROID AND RETINA.

1. INFLAMMATION OF THE CHOROID commences with more or less intolerance of light, dimness of vision, pain in the eye, eyebrow, and forehead, and lachrymation;—the conjunctiva is not uniformly red, but one or more enlarged vessels are seen to proceed from the back of the eye, and to terminate in a vascular zone partially surrounding the cornea. The pupil is often displaced, and brought towards the affected side of the choroid. If it proceed, the sclerotic become thin and blue, showing the choroid through it—a watery fluid is effused between the choroid and retina, causing the thinned part of the sclerotic to bulge out, *(staphyloma sclerotiæ,)* and finally the cornea may become opaque, the eye protrude from the socket, and the whole globe suppurate. The digestive organs are generally much deranged from the first, and hectic and emacia-

tion come on when the eye becomes much distended and painful, *Treatment.*—1. Repeated and profuse local bleeding, by cupping on the temples, and afterwards by many leeches to the eye;—purgatives of calomel and black draught, followed by daily doses of blue pill (gr. v.) and aloes, (gr. iv.) the tartar emetic ointment to the nape of the neck, and the vapour bath to excite the secretion of the skin, are the remedies for the first stage. *Ptyalism* is not considered useful. Afterwards tonics, such as the oxyde of iron and quinine, but especially the liq. arsenicalis, (in doses of ♏ iv ter die,) are of service. When the sclerotic becomes much distended, it should be punctured with a needle—the instrument being introduced for one eighth of an inch towards the centre of the eye, so as not to wound the lens.

II. RETINITIS.—*Acute.* Severe, deep-seated, and throbbing pain in the eye, extending to the temples and head; vision rapidly impaired, or even altogether lost;—frequent sensations of flashes of light, with great fever and delirium. The pupil gradually closes—the iris loses its brilliancy, and the sclerotic is highly vascular and rose-red. If unrelieved, the whole globe may suppurate. 2. *Subacute.*—Dimnesss of sight, headache or giddiness, flushed countenance, and fever, the pupil soon becoming motionless, and the iris turbid. 3. *Chronic.*—Gradually increasing dimness of sight—visions of black spots or flashes of light—irritability of the eye and intolerance of light—but the patient, though he may shade the eye, does not always shut it. These affections are distinguished by the circumstance that dimness of sight and intolerance of light occur before redness, or any external sign of inflammation. *Causes.*—Exposure to vivid light, flashes of lightning, strong fires, the reflection of the sun from snow, and the like—or habitual exertion of the eye on minute objects, together with neglect of exercise, confinement of the bowels, and over-indulgence in food and spirituous liquors. *Prognosis.*—If, in the acute or subacute form, vision is not much impaired, nor the iris altered, nor the pupil much contracted, the prognosis may be favourable. *Treatment.*—General and local bleeding, purgatives, mercury, belladonna, and the antiphlogistic treatment generally, according to the urgency of the symptoms and the strength of the patient.

III. AMAUROSIS.—*Definition.*—Imperfection of vision, depending on some change in the retina, optic nerve, or brain. *Symptoms.*—1. IMPAIRMENT OF VISION, sometimes sudden and complete, but more frequently slow and progressive. At the commencement of the disease, it usually occurs at occasional intervals—perhaps in the form of night-blindness, or day-blindness—or after the eye has been fatigued by writing or other exertion. Sometimes it commences as indistinct vision; (*diplopia*) objects appearing doubled—or as *hemiopia*, one half only of the objects looked at being seen;—or objects may appear crooked, disfigured, or discoloured, or they may be seen

covered with patches, or the affection may commence as near-sightedness, or far-sightedness. The flame of a candle generally appears split, lengthened, or broken into an iridescent halo.

2. *Ocular spectra*, sometimes in the form of floating black spots, *muscæ volitantes*,) sometimes as flashes of light, or as a coloured cloud or network.

3. Sometimes incipient amaurosis is attended with great intolerance of light—sometimes, on the contrary, with a constant *thirst for light*, or feeling as if objects were not illuminated enough.

4. The patient walks with a peculiar uncertain gait, and his eyes have a vacant stare;—the eyelids move imperfectly and seldom—the pupil is generally dilated, (unless it be an incipient case attended with intolerance of light;)—the iris moves sluggishly, and in confirmed cases is totally motionless. But if one eye be sound, and be exposed to light during the examination, the iris of the affected eye will often move in sympathy with that of the sound one.

Diagnosis.—Amaurosis may be distinguished from cataract by noticing, 1. that in cataract, an opake body can be seen behind the pupil, and that the impairment of vision is in proportion to the extent of that opacity; whereas in pure amaurosis, the pupil either shows its natural colour, or else a deep-seated greenish discoloration. 2. That, in cataract, vision is simply *clouded*, and that a lighted candle appears as if enveloped in a mist; whereas in amaurosis, objects are seen *dis*coloured or perverted in shape; and that a lighted candle seems split, or lengthened, or iridescent; and that *muscæ volitantes*, or flashes of fire when the eyes are shut, are not present in pure cataract. 3. That in cataract vision is better in a dull light, whereas it is generally the reverse in amaurosis. 4. That a patient with cataract is always able to discern light from darkness, and that he looks about him and moves his eyes as though conscious that vision still exists, although he may be unable to discern particular objects; whereas in confirmed amaurosis there is a peculiar fixed vacant stare, and the eyeball is protruded and motionless.

Prognosis.—This is generally unfavourable—unless the disease depends on some palpable cause which admits of removal, and unless the remedial measures employed very soon produce good effects.

Varieties.—Amaurosis has been divided into the *functional* and *organic*: the former depending on some sympathetic or other disorder not primarily affecting the structure of the nervous apparatus of the eye.

Causes.—The usual causes of amaurosis are circumstances that over-stimulate and exhaust the retina;—long-continued exertion of the eye;—or exposure to glaring light, especially if combined

with heat—and these exciting causes are particularly aided by intemperance, stooping, tight neckcloths, too much sleep in bed, and any other circumstances capable of producing determination of blood to the head. Amaurosis may also be a consequence of organic change, inflammation, concussion, compression from extravasated blood, fractured bone, morbid effusions, tumors or aneurisms—whether affecting the brain, optic nerves, or eye.

TREATMENT.—The indications are, 1. To rectify any palpable disorder—inflammation or plethora by depletion;—debility by tonics. 2. To neutralise determination of blood to the eye or head by counter-irritation. 3. To stimulate and restore the excitability of the retina.

1. *Inflammatory.*—(*a*) If amaurosis be attended with any of the symptoms of retinitis that have been before enumerated;—(*b*) or if it suddenly follow some injury to the eye, such as a punctured wound, or blow on the naked eyeball, or exposure to a flash of lightning; or if the patient be engaged in occupations that necessarily tax the eye severely; (*c*) or if there be plethora, headache, giddiness, red turgid countenance, frequent flashes of light, or streams of red-hot balls seen before the eyes, (especially when stooping, or undergoing some active exertion,) bleeding or cupping should be performed at intervals. The bowels should be well cleared, the diet should be low, and all employment of the affected organ and violent bodily exertion should be desisted from. Mercury should be administered—rapidly if the case be sudden in its attack, and present urgent inflammatory symptoms—but more slowly if it present a more chronic aspect—small doses of tartarised antimony may be conveniently combined with it, (calomel gr. ii, ant. tart. gr. $\frac{1}{3}$,) or may be given according to F. 34 and 35, but it is scarcely advisable to cause vomiting whilst there are signs of active congestion. Counter-irritants of all sorts are beneficial; blisters, or the tartar emetic ointment applied behind the ears, or to the nape of the neck—immersion of the feet in hot water and mustard—or an issue in the arms in chronic cases.

2. *Atonic* amaurosis may come on at the close of some long and exhausting illness, or may be produced by great loss of blood, menorrhagia, immoderate suckling, leucorrhœa, excessive venery, or other debilitating circumstances. It is attended with general debility, frequent trembling pulse, and dilated pupils;—and the patient generally sees best after a meal or a few glasses of wine, and in a strong light. The practitioner must carefully examine into the causes of debility—whether they consist in some disorder of the system, or in depraved and unhealthy habits of life. The *treatment* consists in strengthening the system by change of air, tonics, quinine, steel and zinc, and especially by good living; at the same time that the abdominal secretions should be well regulated, and the cutaneous and general circulation be promoted by

exercise and bathing, especially the shower-bath. Camphor, or arnica,* assafœtida, and other fetid stimulants, may be of service. It is in this form, if in any, that local stimulants are applicable—such as exposing the eye to the vapour of æther, or sal volatile, (a teaspoonful of either being held in the hand,) taking electric sparks from the eye; stimulating snuff, (F. 32, 33,) cataplasms of capsicum to the temples; strychnine applied to the temples after the skin has been denuded by a blister, beginning with gr. $\frac{1}{8}$, and gradually increasing it to gr. i;—friction of the forehead with cajeput or croton oil, or with an alcoholic solution of veratria.

3. *Sympathetic.*—(*a*) Amaurosis not unfrequently supervenes on an attack of jaundice. If there be evidence of congestion in the head, as there frequently will be, blood should be taken by cupping, whilst the abdominal disorder should be removed by appropriate measures. (*b*) If there be foul tongue, disagreeable eructations, tumid belly, and other evidence of abdominal congestion and disorder, emetics, repeated once or twice a week, (provided there be no determination to the head,) blue pill, purgatives, such as senna, aloes, and rhubarb, with soda, magnesia, and ipecacuanha, till the secretions are set to rights, followed by tonics and counter-irritants, are the requisite measures. In similar cases, some foreign authors recommend the use of Schmucker's or Richter's *resolvent pills*, F. 34, 35. Turpentine should be given both as a purgative and enema, if there be signs of worms. (*c*) Amaurosis sometimes arises from irritation of the fifth pair of nerves. If it follow a wound on the forehead, the latter should be dilated, or if it have healed, the cicatrix should be cut out. Tumors of all sorts near the eye, or carious teeth, should be removed.

4. *From Poisons.*—Amaurosis is liable to be induced by certain poisons, such as lead, belladonna, hyoscyamus, and especially by tobacco, that great patron of undertakers and bailiffs, whether administered in large doses, or applied slowly and frequently. After the removal of the immediate effects of the poison, the various local stimulants and counter-irritants mentioned above are most likely to be useful.

5. *Organic.*—These cases are the most hopeless. If the disease has followed an injury of the head, or fit of apoplexy, or syphilis, or if there be reason to suspect tumors,—an alterative course of mercury, or of iodine, with counter-irritants, and attention to the general health, should be tried, and sometimes may effect a cure. For other forms of organic disease, especially if there be fixed pain in the head, palsy, or epilepsy, or idiocy, the best thing that the surgeon can do will be to keep up the strength, to prevent congestion in the head by occasional depletion, (if it can be borne,)

* Dose f℥i of an infusion, made with ℥ß of the dried leaves, to 0j of boiling water. It should be combined with aromatics.

counter-irritation; and to maintain the secretions of the liver and bowels, and to guard the patient from every excess or exertion, mental or bodily, that is capable of accelerating the cerebral circulation.

IV. Short Sight (*myopia*) may depend on some vice of original conformation—such as a too great thickness, density, or convexity, of the lenses and humours of the eye, so that the rays of light are brought to a focus before they reach the retina; or may be induced by habits of study, and by looking at minute objects, which, by irritating the eye, cause the secretion of aqueous humour to be increased, and render the cornea more convex. It is a popular error to imagine that the sight improves as the individual grows older. *Treatment.*—The eyes should be exercised and accustomed to look at distant objects. Nothing can be better than shooting and field-sports generally. Concave glasses should be avoided if possible, or at all events should only be worn when required to prevent unseemly stooping in reading or playing music. Spectacles should always be used in preference to a single glass. The patient should choose a pair that enables him to see objects within forty feet as distinctly as other people,—the names on the corners of the street for instance; but the glasses are too concave if they make objects appear dazzling, or smaller than usual.

V. *Presbyopia*, or longsightedness, depends on diminished density of the humours, and is one of the earliest signs of impaired nutrition in old age. The patient's sight must be remedied by convex glasses; but he should not resort to them at first—nor change those first selected for stronger ones before he is absolutely compelled; and the sight should be spared by candle light as much as possible.

SECTION X.—OF MALIGNANT DISEASES OF THE EYE.

1. Scirrhus.—After years of supposed inflammation, the eye becomes shrunk and hard, and the conjunctiva tuberculated, thickened, and red. The eye is exquisitely tender; there is much burning or lancinating pain, and severe hemicrania. After a time, ulceration occurs, spreads to the neighbouring parts, and the patient sinks. *Treatment.*—Extirpation, if it can be adopted before the lids are affected; if not, the local and general employment of narcotics.

II. Fungus Medullaris is not unfrequent, especially in children. Its most frequent seat is the termination of the optic nerve. The eye is accidentally discovered to be blind, and a small tumor of a peculiar metallic lustre can be detected very deep behind the pupil. This gradually advances, and generally appears whitish or yellowish, and lobulated, and more or less streaked with blood-vessels. In a space of time, varying from a

few months to two or three years, the cornea bursts before the enlarging tumor, a bleeding fungus protrudes, the cervical glands enlarge, and the patient perishes. There is not usually much pain before the cornea begins to be distended. Melanosis is sometimes combined with this disease. *Treatment.*—Extirpation is the only remedy. But it is scarcely ever deemed advisable in children, (1) because the disease is sure to return; (2) because there are sundry tumors which cannot be distinguished from the malignant, and which either disappear, or give no trouble. The diagnosis may be considered doubtful, if such tumors follow an evident wound or injury, if there be scrofulous disease in other parts, and if the eye shrink and become atrophic.

III. Encanthis is an enlargement of the caruncula lachrymalis, and semilunar fold of the conjunctiva, which may be easily extirpated by curved scissors. Sometimes, however, it assumes a malignant action, becoming dull, red, very hard, and subject to lancinating pain; and finally it degenerates into a cancerous ulcer. Sir A. Cooper thinks that in this case extirpation is inadmissible.*

CHAPTER XIII.

OF THE DISEASES AND INJURIES OF THE EAR.

I. Foreign Bodies may be removed from the ear by syringing it violently with warm water, or by a pair of small forceps,—or by a small scoop, or curette, or bent probe, which may be introduced behind the intruding substance, so as to draw it forwards. Insects may be removed by similar means, or by introducing a piece of cotton fastened to the end of a probe, and smeared with honey, or some other viscid substance.

II. Acute Inflammation—(*otitis*)—of the *external* ear is known by violent pain in the part, increased by pressure, by noise, by the motions of the head and of the lower jaw, and by exposure to cold air. Hearing is confused, and there are noises in the ear, (*tinnitus.*)

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* Vide Lectures by Professor Green, in Sir A. Cooper's Lectures, Renshaw's edit.; Lawrence on Diseases and on Venereal Diseases of the Eye; Copland Dict., *Art.* Eye, Amaurosis, &c.; Mackenzie on Diseases of the Eye, second edition; Middlemore on Diseases of the Eye; Guthrie on the Operative Surgery of the Eye, and in Lond. Med. and Surg. Journal; Littell's Compendium, and Foote's Ophthalmic Memoranda.

The meatus is swelled, and highly vascular, and secretes a thin serous fluid. Inflammation of the *internal* ear is attended with much severer pain, and constant ringing, throbbing sounds. Both are accompanied with severe headache and fever, and may prove fatal. They are generally *caused* by cold, foreign bodies, or gastric derangement, and are most frequent in children. *Treatment.*—Leeches behind the ear, or bleeding, if the patient is old enough to bear it, and if it be demanded by violent fever and delirium;—subsequently, an emetic, followed by a dose of calomel with antimony, purgatives, and salines. The ear may be very gently syringed with poppy decoction, or milk and water, or may be poulticed. All foreign bodies, or hardened wax, should be gently removed. Blisters should be applied to the nape of the neck, or behind the ear, when the acute stage is subsiding. If the cavity of the tympanum have suppurated, which will be known by an aggravation of the throbbing pain, and headache, and by a sense of weight and bursting in the ear, and by the membrana tympani* appearing white and convex externally, it should be opened with a long slender knife, to save the pain and delay of its ulcerating or bursting. But this operation should not be hastily performed; and if early and free antiphlogistic measures are employed, it will rarely be required.

III. CHRONIC INFLAMMATION—(*otorrhœa*)—a mucous or mucopurulent discharge from the ear, is very common in scrofulous children, and may last for a long term of years. *Treatment.*—Mild aperients should be given frequently, together with tonics, such as iron, bark, and iodine, in the manner directed for scrofula. *Sulphur* is much praised as a laxative in these cases. Blisters may be applied behind the ear, or to the nape of the neck, and may be repeated, or be kept discharging by cerat. sabinæ. It is well known that sundry dangerous affections of the brain, or disorders of the eye, or of other parts, are liable to supervene upon the suppression of this discharge. Therefore, at first, no other local applications should be used save mild injections to cleanse away the discharge; such as warm milk and water, or dec. papav., avoiding oily matters, lest they become rancid and irritating. If, under the employment of these measures, the discharge diminishes, without any ill consequences, mild astringent injections may be tried, beginning with lime-water, or inf. rosæ, and afterwards the different lotions in F. 36, 37, 21, 22, 23, taking care to increase their strength very cautiously, especially if the membrana tympani have been perforated by previous ulceration or suppuration. If the discharge cease, and there be pain in the ear or head, hot poultices or fomen-

* In order to bring this part into view, the auricle requires to be drawn outwards, upwards, and forwards; if necessary, the meatus must be dilated with a speculum.

tations, and the remedies for acute inflammation should be adopted.

IV. CARIES of the temporal bone, especially of the mastoid process, may be a consequence of extension of inflammation from the mucous membrane of the ear, particularly if the cavity of the tympanum has suppurated, and matter has lodged and become putrid, after the membrana tympani has burst, or has been opened. There is constant *otorrhœa*, and the discharge is sanious and fetid, and stains silver probes. This is a most serious disease. Death may be caused by extension of the caries to the cranial cavity and suppuration on the dura mater, or by inflammation of the brain or its membranes, through contiguous irritation,—or the side of the face may be palsied through compression of the portio dura. Sometimes an abscess bursts behind the ear, or burrows amongst the muscles of the neck and points low down. *Treatment.*—Tonics, alteratives, counter-irritants, and mild astringent injections, frequently repeated, to wash away the fetid discharge. Abscesses near the ear should be opened as soon as possible. Injections of nitric acid lotion (F. 17) may be employed to correct the disease of the bone, provided there is no fear that it may have reached the dura mater. If the patient be labouring under secondary venereal symptoms, F. 29 may be given with advantage. If inflammation, or symptoms of compression of the brain supervene, they must be treated as was detailed in Chapter X., recollecting that depletion and mercury must be used with the greatest moderation, as they cannot remove the exciting cause.

V. EARACHE—(*otalgia*)—(1.) Genuine *neuralgia* of the ear,—occurring in fits of excruciating pain, shooting over the head and face,—may be distinguished from *otitis* by the sudden intensity of the pain, which is not throbbing,—does not increase in severity,—is not attended with fever,—and comes and goes capriciously. Its *causes* are the same as of neuralgia generally, (p. 238) but particularly caries of the teeth; and its *treatment* must also be the same.

(2.) *Common earache*, which is frequently produced, in children especially, by decay of the posterior teeth, or by cold, although a sympathetic affection, is generally somewhat inflammatory. *Treatment.*—An emetic and purgative will mostly be of service. Carious teeth should be extracted, and gum boils be opened. The pain may be relieved by filling the meatus with a warm mixture of ol. oliv. ℥i, tinct. opii ℥i, the concha being plugged with cotton, to keep it in; or by exposing the ear to the vapour of sp. æther c. ℥iii aq. f℥iv, which may be put into a phial, immersed in hot water,—or by the crumb of a hot loaf applied to the head; or by sponging the head with hot water, and wrapping it up in an oil silk cap, together with hot pediluvia and enemata, and in obstinate cases, blisters. An examination for hardened wax, or foreign bodies, in the meatus, should never be omitted.

VI. WARTS and excrescences in the meatus are not uncommon in chronic inflammation, and may be snipped off, or be removed by the various injections before mentioned.

VII. DEAFNESS may be a consequence of very many pathological conditions. (1) It may be caused by *chronic inflammation* of the external meatus, or membrana tympani, with thickening, or excrescences of the membrane, and purulent discharge. These cases must be treated by counter-irritants, attention to the health, and the cautious use of injections. If the cuticle of the meatus and membrana tympani is much thickened, injections of arg. nit. or of ung. hydr. nit. ʒj, ol. oliv. ʒiii, are much recommended. The internal ear may have suppurated, and the *ossicula* may have been sloughed away, but still deafness is not total unless the *stapes* has perished,—the loss of which would lay open the *fenestra ovalis*, and permit the escape of the fluid in the *labyrinth*. (2) *Accumulations of hardened wax* depend on a diseased state of the meatus. They should be frequently removed with the syringe; and combinations of oxgall ʒii vel ol. terebinth f ʒj with ol. oliv. f ʒvii; or tinct. castorei, may be occasionally dropped into the ear. Similar applications are sometimes used when it is conceived that there is a deficiency of wax. In syringing the ear, the water mostly requires to be rather hot, and a little wool should be introduced afterwards to prevent cold. (3) Deafness may be caused by tumors of the tonsils obstructing the eustachian tubes, or by relaxation of the mucous membrane of the throat, with secretion of viscid mucus in the tube—or by contraction, or by obliteration of the tube consequent upon ulcers,—a thing not uncommon after scarlet fever and venereal sore throat. These cases will be known by the patient's history, and by an examination of the throat. *Treatment.*—Chronic sore throat or swelling of the tonsils must be removed by stimulating and astringent gargles,—by iodine, tonics, counter-irritants, and attention to the general health. The eustachian tubes may be known to be pervious if the shock of air can be heard against the membrana tympani, by means of the stethoscope applied to the mastoid process, whilst the patient closes his mouth and nostrils and makes a strong expiration. These tubes or the cavity of the tympanum may be known to be clogged with mucus, when loud crackling or gurgling noises are heard by the patient, (or by the surgeon with the stethoscope,) when he expires strongly with the mouth and nose closed. For this state, it is useful to wash out the tube and tympanum with warm water. A bent silver catheter is introduced through the inferior meatus of the nostril into the pharynx, and then its point being turned upwards and outwards will slip into the tube. Warm water may then be gently injected by a syringe, and if the tube be pervious, it will be heard and felt to strike against the membrana tympani. If it be not, a catgut may be very gently passed through the catheter to dilate it. (4) Deafness is often caused by *blows* on the head, which either pro-

duce concussion or rupture of the auditory nerve, or extravasation of blood into the tympanum or labyrinth. Depletion, if any inflammatory symptoms are present, with alteratives and counter-irritants, are the only remedies; but if deafness immediately succeeded the injury, they will scarcely relieve it. (5) It may be produced by *organic* alterations in the brain, tumors or the like, and may be attended with epilepsy or idiocy, or may be a consequence of apoplexy or convulsions. The *treatment* must be the same as for amaurosis arising from similar causes, (p. 291.) (6) It is sometimes connected with general plethora, or with suppressed menstrual or hæmorrhoidal discharge, and attended with giddiness, tinnitus, and flushings of the countenance. To be treated antiphlogistically. (7) Deafness is said to be *nervous* when it depends on general torpor and debility, and is better at some times than at others, especially in fine weather, and when the patient is cheerful or excited, and the stomach in good order. *Treatment.*—Aperients and alteratives, with diffusible stimulants, especially ammonia, æther, and valerian, taken occasionally, and the employment of excitants locally; such as stimulating gargles, (tinct. capsici fʒiß ad inf. rosæ Oiß,) *masticatories* of pellitory, snuffs, (F. 32,) the introduction of oxgall or turpentine, or the vapour of æther or of sp. am. ar. into the meatus, and the application of garlic, mustard, and other counter-irritants behind the ear. *Electricity* may be mischievous.*

CHAPTER XIV.

OF THE DISEASES AND INJURIES OF THE FACE AND NOSE.

I. SALIVARY FISTULA is formed when a wound or an ulcer has made a communication between the *stenonian* duct and the skin, so that the saliva dribbles out on the cheek. *Treatment.*—In the first place, a good passage must be established from the duct into the mouth. This may be done by puncturing the mouth through the fistula in two places, passing a small skein of silk, or, still better, a piece of very flexible wire, through the apertures, and securing the two ends in the mouth by a knot. After a few days

* Vide Copland Dict., art. Ear and Hearing; Kramer on Diseases of the Ear, translated by Bennett; and Pilcher on the Structure and Diseases of the Ear, Lond. 1838.

the edges of the fistula must be pared, and be brought into contact by sutures, in order that they may unite by adhesion. When there has been a loss of substance, it may be necessary to apply the actual cautery to the margin of the aperture, in order that the fungous granulations succeeding the burn may supply the deficiency; or to cover it with a flap of skin raised from the adjoining parts.

II. LIPOMA, a hypertrophy or sarcomatous tumor, sometimes affects the cellular tissue and skin of the nose, especially of persons who have been addicted to the pleasures of the table. These tumors are very inconvenient and unsightly, but not malignant. They grow slowly—are indolent and painless—the sebaceous follicles are much enlarged, and secrete profusely, and the skin is more or less mottled with veins. *Treatment.—If the patient desires it*, the tumor may be removed with a knife; but he must observe rigid abstemiousness, and have his bowels well cleared for a fortnight previously. An incision may be made in the median line nearly down to the cartilage. Then an assistant distends the nostril with his forefinger, whilst the surgeon seizes the morbid growth, and shaves it clean off, close to the cartilage. After the operation, there will be considerable hæmorrhage from numerous vessels. Some of these may be tied, some may be pinched with a forceps, some may be tied with a very fine cambric needle and thread; and any general oozing may be restrained by the application of a cloth dipped in cold water, or if it be obstinate, by plugging the nostrils, and making pressure with strips of plaster.

III. FOREIGN BODIES may be removed from the nose by a small curette, or scoop, or bent probe. If they cannot be brought through the nostrils, they may be pushed back into the throat. The removal should be effected as early as possible.

IV. EPISTAXIS—hæmorrhage from the nose, may, like other hæmorrhages, be produced, 1st, by injury; 2ndly, by an *active* exhalation of arterial blood from the capillaries, owing to general excitement and plethora, or determination of blood to the head, or to the suppression of some other discharge; 3rdly, by a *passive* draining of blood, (principally venous,) owing to obstruction of the circulation by disease of the heart or liver, or to a morbidly thin state of the blood, together with relaxation of the vessels, as happens in scurvy, purpura, and the last stage of fevers. *Treatment.*—(1.) If the patient be redfaced, plethoric, and subject to headache and giddiness, the hæmorrhage should be regarded as salutary, and should not be restrained too suddenly. If it be very profuse, and attended with much headache, venæsection may be performed, and at all events purgatives and low diet should be prescribed. (2.) But the hæmorrhage requires to be stopped, if it continue so long that the patient will be injuriously weakened, or if it arise from injury, or if it be a *passive* hæmorrhage depending on visceral disease, or general cachexy. If an upright posture, cold applied

to the head, and a piece of cold metal to the back, with a draught of any cold liquid, and compression of the nostril, do not stop it, the patient may snuff up powdered gum, or gall nuts; and, that failing, the nostril must be plugged with lint, several pieces (oiled) being introduced by means of a probe. In very urgent cases, the posterior orifice of the nostril must be plugged also. This is easily done by passing a bougie, with a long piece of silk fastened to its end, through the nostril into the pharynx. The end of the silk in the pharynx is then brought through the mouth with a pair of forceps, and a piece of soft sponge, less than an inch in diameter, is tied to it. Then, by pulling the silk back through the nose, the sponge is drawn into the posterior opening of the nostril. The plugs, or coagula, in severe cases, should not be disturbed for three days. Nitre and other salines; pills of plumbi acet. gr. ½, opii gr. ¼, with draughts containing ℥ss of vinegar, may be given with advantage in inflammatory cases—and the nitric or sulphuric acids, opium, alum, quinine, small doses of turpentine, (♏ xv,) and the ergot of rye, in those of atony and debility.

V. NASAL POLYPUS.—The common *gelatinous* polypus is a tumor of the consistence of jelly, pear-shaped, yellowish, slightly streaked with bloodvessels, attached by a narrow neck to the mucous membrane, especially that on the turbinated bones, and apparently consisting of organised lymph. The patient has a constant feeling of *stuffing* and cold in the head, which is increased in damp weather. If he force his breath strongly through the affected nostril, whilst he closes the other, the polypus may be brought into view. There are very often more than one of these tumors, and they are very liable to return when removed. If polypus be permitted to remain, it continually increases in size, blocks up the nostril, displaces the septum and obstructs the other nostril, causes prodigious deformity of the cheek, prevents the passage of the tears, and may even cause death by pressure on the brain. *Treatment.*—A probe should be introduced to feel for the neck of the polypus, which should then be seized with forceps, and be gently twisted off. If, as sometimes happens, it projects backwards into the pharynx, it must be extracted through the mouth with curved forceps. After the operation, the nostril should be plugged to restrain bleeding.

2. The *hydatid polypus* is a rare species, consisting of a number of thin vesicles filled with a watery fluid, and attached by a peduncle. The vesicles burst upon the slightest pressure, and their reproduction may be prevented by touching the peduncle frequently with a hair-pencil dipped in butter of antimony.

3. The *carcinomatous polypus* is nothing more than a scirrhous tumor in the nose. It may be known by its occurring in the old—by the cancerous cachexia, the hardness of the tumor, and lancinating pain.

4. The *fungoid polypus* is a soft red tumor, growing with grea

rapidity, frequently bleeding, and pursuing the ordinary course of fungus hæmatodes. This, like the last, admits only of palliative treatment.

VI. CHRONIC INFLAMMATION, and tumefaction of the Schneiderian membrane, must be treated by occasional leeches, scarifications, and alteratives. Sometimes in young children, the membrane swells into little red fleshy eminences, which may be touched with nitrate of silver, but must not be mistaken for polypi, nor be meddled with by the forceps.

VII. OZÆNA signifies a fetid discharge from one or both nostrils, depending on ulceration of the membrane with or without disease of the bones. It is most frequently a venereal affection, and when so, must be treated accordingly, (p. 177.) But it sometimes occurs in scrofulous children, and in others who are perfectly free from venereal taint. Astringent injections—of nitrate of silver, sulphate of copper, &c.—and of the chlorides of soda and lime, (F. 39,) to correct the fœtor, with attention to the health, are the only remedies.

VIII. The nostrils are sometimes *imperforate*, owing to congenital malformation. The passage may (if the parents wish it) be restored by a cautious incision, and must be kept open with bougies. If, however, the obstruction be seated far back, it ought not to be meddled with.

IX. ABSCESS OF THE ANTRUM may be caused by blows on the cheek, but more frequently by the irritation of decayed teeth. It is known by permanent aching and uneasiness of the cheek, preceded probably by acute inflammatory pain and fever, and followed by a slow, general enlargement of the cheek, and loosening of the subjacent teeth. The parietes of the cavity sometimes become so thin from distension that they crackle on pressure like parchment. Sometimes (though rarely) the matter makes its way into the nostril; and sometimes the abscess points externally, or bursts into the mouth. *Treatment.*—A free aperture must be made into the cavity. If either of the molar teeth is loose or carious, it should be extracted; and a trocar be pushed through the empty socket into the antrum. But if the teeth are all sound, or if they have been all extracted before, an incision should be made above the alveoli through the membrane of the mouth, and the bone be pierced by a strong pair of scissors or trocar. The instruments should not be made of too highly tempered steel, lest they might break. The cavity should be frequently syringed with warm water, in order to clear away the matter, which is sometimes thick and lardaceous. If the discharge continues profuse and fetid, search should be made with a probe for loose pieces of bone, which should be removed without delay, the aperture being enlarged if necessary.

X. The antrum may become enormously distended, and its parietes thin and crackling on pressure, in consequence of an accumulation of its natural clear mucous secretion, the aperture into the

nostril having become obliterated. An opening must be made in the manner just directed.

XI. FUNGUS MEDULLARIS may commence in the lining membrane of the antrum, or in the sockets of the adjoining teeth. In its first stage it forms a hard tumor in the cheek, with a constant sense of pain and uneasiness. After a time, some portion of it feels soft and pulpy, and then bleeding fungous tumors project from the cheek, or into the mouth, or into the orbit, causing horrid pain and deformity, protruding the eye from its socket, and leading to the inevitable fatal results of fungus hæmatodes. (p. 190.) *Treatment.*—The only remedy is extirpation of the superior maxillary bone; but it must be performed before the diseased growth has burst from the cavity, and before the skin and lymphatic glands have become implicated.

XIII. A NON-MALIGNANT TUMOR is sometimes developed in the antrum, or on the external surface of the bone. On a section, it appears a dense, homogeneous, fibrinous mass, containing spiculæ of bone. Its origin is generally ascribed to external injury, or to disease of the teeth. It may be distinguished from malignant disease by noticing that its growth is slow, that its surface is lobulated, that it feels hard and elastic, like brawn interspersed with bony particles; that although the superjacent skin may become turgid and purple with distended veins, still that it does not become incorporated with the tumor, and that although ulceration may accidentally occur on its surface, still that the ulcers are superficial, furnish no fetid discharge, and may heal on the removal of the exciting cause. These tumors may, if suffered to remain, destroy life by suffocation and starvation. *Treatment.*—The tumor must be extirpated entirely, and for this purpose it will be necessary to remove the superior maxillary, and perhaps the malar bone. An incision must be made with a straight bistoury from the nasal process of the superior maxillary bone to the mouth. It must go quite down to the bone,—must detach the nasal cartilages, and cut through the lip in the median line. A second must be made from the external angular process of the frontal bone to the corner of the mouth; and if the malar bone is to be removed, a third, at right angles to the second, must be made along and down to the zygoma. The flap is then dissected up, the infraorbital nerve divided, the inferior oblique muscle and other parts separated from the floor of the orbit, and supported with a narrow bent copper spatula; the nasal process of the superior maxilla, and its junction with the malar, are divided with strong bone forceps, (or if the malar is to be removed, its junction with the frontal and the zygoma must be divided instead;)—a notch must be made in the alveolar process of the middle incisor tooth, (which should be extracted before the operation,) the anterior half of the roof of the mouth be divided with a pair of strong scissors, one blade being put into the nostrils, the other into the mouth; the tumor thus loosened is then forcibly moved, and its remaining

attachments are divided with the knife, carefully preserving the velum palati. During the operation, the common carotid is compressed to prevent hæmorrhage. After it, arteries are to be tied, the chasm to be filled with lint, and the wound closed with sutures.

XIII. RHINO-PLASTIC OPERATIONS.—When a portion or the whole of the nose has been destroyed by disease or accident, the deficiency may be restored by a transplantation of skin from an adjoining part. (1.) When the whole or greater part has perished, a triangular piece of leather should be cut into the shape which it formerly presented, and be spread out flat on the forehead, with its base uppermost, and its boundaries should be marked out on the skin with ink. Then the remains of the old nose (if any) are to be pared, and the margins of the nasal aperture are to be cut into deep narrow grooves. When the bleeding from these wounds has ceased, the flap of skin marked out on the forehead is to be dissected up, and all the cellular tissue down to the periosteum with it, so that it may hang attached, merely by a narrow strip of skin between the eyebrows. When all bleeding has ceased, the flap is to be twisted on itself, and its edges are to be fitted into the grooves made for their reception, and to be fastened with sutures. The nose thus made is to be supported, but not stuffed, with oiled lint;—it should be wrapped in flannel to support its temperature, and if it become black and turgid, owing to a deficiency in the return of blood from it, a leech may be applied. When adhesion has thoroughly taken place, the twisted strip of skin, by which its connexion with the forehead was maintained, may be cut through, or a little slip may be cut out of it, so that it may be laid down smoothly. (2.) The septum or columna nasi is often restored at the same operation with the nose itself, by means of a flap from the forehead; but it is better, as Mr. Liston proposes, to form it out of the upper lip at a subsequent operation. A strip is cut out of the centre of the upper lip, a quarter of an inch in breadth, and of its whole thickness. The frænulum having been divided, this strip is turned up, but not twisted; and its labial surface having been pared off, and the inside of the apex having been made raw, the two latter surfaces are united by the twisted suture, and the wound of the lip is also united by the same. During the cure, the nostrils must be kept of their proper size by introducing silver tubes occasionally. (3.) When one ala nasi alone is destroyed, a portion of integument may be measured out on the cheek, and be raised to supply the deficiency. But if both alæ are lost, or if the cheek is spare and thin, it is better to supply their place with skin brought from the forehead. The slip which connects the engrafted portion with the forehead will of course be long and thin; and in order to maintain its vitality, a groove may be made to receive it on the dorsum of the nose. But when union has occurred, this connecting slip may be raised and cut off, and the groove which contained it be united by sutures. (4.) Depression

of the apex of the nose is to be remedied by raising the parts, dividing any adhesions that may have formed, making, if necessary, a new *columna*, in the manner described above, and supporting the parts carefully with plugs of lint, till they have acquired firmness. (5.) Depression of the ridge, owing to loss of the ossa nasi, may be remedied by paring the surface, and covering it with a flap of skin from the forehead, or by making a longitudinal incision, and engrafting a small portion of skin from the forehead into it; or, if the case is slight, by cutting out one or two *transverse* slips, and bringing the cut edges together by sutures, so that thus the surface may be stretched to its proper level.

XIV. HARE-LIP signifies a congenital fissure of the upper lip. It may exist only on one side, or there may be a double fissure with a small flap of skin between. Sometimes there is also a fissure in the bony palate,—sometimes in the soft palate also,—sometimes the anterior incisor teeth and their alveoli project through the fissure,—all which conditions give rise to considerable deformity and impediment in speaking and feeding. *Treatment.*—The edges of the fissure, which are red like the lip, are to be pared, and then made to unite by adhesion. The operation should be performed either before the cutting of the teeth, or after it—the latter time is the safer. If the patient is a child, his body should be entirely wrapped in a cloth, to prevent struggles; and the surgeon sits behind him, taking the head between his knees. Then he seizes the lip by its corner, penetrates it with a narrow straight knife above the angle of the fissure, and carries the instrument downwards, so as to shave off the edge of the fissure. This process is repeated on the other side, and the two strips are next detached from the upper angle. When bleeding is checked, the edges are to be brought into most exact union by the twisted suture. Two hare-lip pins should be used, (or long slender needles with spear points, shown at p. 90, may be substituted.) The first pin should be inserted near the angles of the fissure; and if the labial artery bleed, the other should be placed so as to transfix and compress it. They should penetrate full two thirds of the thickness of the lip. They may be removed on the fourth or fifth day; and a slip of adhesive plaster may be drawn from one cheek to the other instead. If the hare-lip is double, both sides may be operated on at once, the middle flap being transfixed by the pins. If one or more teeth project in the fissure, so as to offer any impediment to its union, they should be extracted; and if the bone project, it also should be cut off with pliers, the soft parts on it having been first divided with the knife.

XV. FISSURE OF THE PALATE, when extending through the bones, and forming a wide aperture into the nose, cannot be cured. The parts become slightly approximated during growth—and at puberty the defect may be palliated by means of a metallic or ivory plate. But when the *velum pendulum palati* alone is fissured—and

the fissure not very wide, it may be remedied by the operation of *staphyloraphe*—which, however, must necessarily be deferred till puberty, or it would be defeated by the patient's struggles. The edges of the fissure are first pared—then they are united by three interrupted sutures, which may be very easily introduced by means of Mr. Beaumont's instrument described in the twentieth volume of the Med. Chir. Trans. Before the sutures are tightened, a shallow incision may be made in the velum on each side near the alveolar border, in order to diminish the tension. The patient must fast for twenty-four hours, and on the succeeding days must take very small quantities of thick fluids.

XVI. CANCER OF THE LIP commences as a small scirrhous tumor, or wart, or as a small fissure caused by the irritation of smoking, which gradually degenerates into a foul ulcer, with hardened base and ragged surface. *Treatment.*—The disease must be extirpated by a V incision—taking care to include the whole of it—and uniting the wound afterwards like that of hare-lip. If, however, the whole or greater part of the lip be implicated, the diseased parts should be freely removed without any subsequent attempt to produce union. The extirpation cannot be expected to be effectual unless performed before the glands are implicated—but it is justifiable at any stage—in order to avoid for a time the horrible pain and fœtor of the ulcerative process. It has been very clearly shown by Mr. Earle, that any ulcers, if subjected to perpetual irritation, (and especially ulcers near the outlets of the body,) may assume a malignant appearance, which ceases on the removal of the irritant. When therefore there are foul ulcers on the lips, cheeks, or tongue, the teeth should be well examined in order to remove any roughness, or collections of tartar.

XVII. CANCER ORIS—(*Phagedæna oris, gangrenous ulcer*, erosion of the cheek, vide p. 74)—is a phagedæno-gangrenous affection of the lips and cheeks, occurring almost exclusively to female children amongst the ill-fed squalid population of large towns. It is very liable to follow the measles or scarlatina, or any similar weakening disorder. Sometimes it commences as an ulcer on the inside of the cheeks or gums, spreading rapidly and exuding a fetid discharge. Sometimes the lips and cheeks become firm, swollen, and pale red, and a gangrenous spot appears upon them, which gradually spreads and involves the whole face,—whilst phagedænic ulceration is going on inside the mouth. The mortification, however, has been known to begin and spread, without being attended with any inflammation whatever,—the parts around it being pale and wax-like. This disease is attended by signs of great debility from the first, and by typhoid symptoms subsequently,—so that it is frequently fatal. *Treatment.*—The indications are, 1st, to clear out the alimentary canal, and improve its secretions by daily mercurial and other purgatives; 2ndly, to keep up the strength with bark, wine, and nourishing diet; 3rdly, to check the diseased ac-

tions by stimulants, such as lotions of port wine, dec. cinchonæ, arg. nit., the chlorides, &c.—and if they fail, to destroy the parts with the strong nitric acid.

XVIII. SMALL TUMORS containing a glairy matter, and probably consisting of obstructed mucous follicles, are often met with on the inner surface of the cheeks and lips.

XIX. RANULA is a similar tumor, found under the tongue. It may either consist of one of the Whartonian ducts, or of a follicle obstructed. This and the foregoing tumors are best treated by snipping out a small piece of the sac, and rubbing the interior with lunar caustic;—or by passing a small seton through the sac.

XX. TONGUE-TIE—a prolongation of the frænum linguæ, confining the apex of the organ—is by no means so common as is often supposed. The frænum may easily be divided with a blunt-pointed pair of scissors—taking care to direct their points downwards, so as to avoid the lingual artery.

XXI. WOUNDS of the tongue are liable to be attended with severe hæmorrhage from the lingual artery. If the bleeding orifice cannot be tied, one or more ligatures must be introduced with curved needles, so as to include and constrict the bleeding parts—or a heated iron may be applied through a tube.

XXII. INFLAMMATION of the tongue—known by great swelling, tenderness, and difficulty of speaking and deglutition, must be treated by bleeding and leeches, purgatives, slight incisions, and the antiphlogistic regimen generally. Inquiry should be made whether the patient has been taking mercury. If abscess form, the fluctuating part should be opened.

XXIII. HYPERTROPHY.—Slow enlargement, without tenderness or structural disease, sometimes affects the tongue, causing it to protrude permanently from the mouth. The superfluous portion may be removed by ligature—a needle armed with a strong double ligature being passed through the centre of the tongue, and one thread being then tied very tightly round each half. But if it be not very considerable, a A shaped portion may be cut out from its anterior extremity—the cut surfaces being united by suture after bleeding vessels are tied, and oozing has ceased.

XXIV. CANCER.—A foul excavated ulcer, with extremely hardened base, prominent edges, burning and lancinating pain, and the *cancerous cachexia*, (p. 187,) preceded by nodular scirrhous enlargement—should be extirpated with the knife—or if extensive, with ligatures, in the manner before described.

XXV. ULCERS presenting very formidable characters are often attributable to local irritation, (from diseased teeth, &c.,) or to some derangement of the health—perhaps a venereal taint.—The obvious indications are, to remove local irritation—to keep up the secretions of the liver and bowels—to regulate the diet—and support the strength. Plummer's pill—sarsaparilla—or F. 29 and 30

—hyoscyamus and conium—perhaps iodine—and the local and general treatment of *irritable* ulcers will be of service.

XXVI. LANCING THE GUMS.—If at any time during dentition a child be feverish and restless, with its stools slimy and clay coloured, or if there be any symptoms of disorder in the head or chest, the gums should be examined; and if any part, especially where a tooth is soon expected, appear red and swollen,—a free incision should be made with a gum lancet quite down to the tooth. This affords instant relief by removing the tension and pain. The edge of the lancet should be turned outwards, so as to avoid the sacs of the permanent teeth.

XXVII. IRREGULARITY of the permanent teeth is a frequent consequence of injudicious haste in extracting the temporary set—an operation which not only permits the arch of the jaw to become contracted, but disturbs the nutrition of the permanent teeth, hurries their appearance, and ensures their early decay. The temporary set should always be suffered to remain as long as possible. The only ones that there need be any haste in extracting, are the upper incisors, in order to prevent their successors from growing behind their natural position, which would render the mouth underhung. If either of the canine teeth, or one or more of the incisors of either jaw project much, the patient should be taught perpetually to endeavour to push it back into its proper situation with his fingers. But if at the age of fourteen or fifteen this method has not succeeded, and the teeth are much crowded, the projecting tooth may be removed—although in many cases it is better to sacrifice one of the bicuspides to make room for it. If one or more of the superior incisors project backwards, it must be drawn forwards by means of ligatures attached to a gold bar worn in front of the teeth—for the manner of applying which the reader is referred to Bell on the Teeth.

XXVIII. FRACTURE AND DISLOCATION.—If a portion of a tooth is broken off, the exposed surface should be filed smooth, and then no immediate inconvenience will probably follow. If, however, the greater part of the tooth is lost, and considerable pain and swelling of the gum should arise, extraction should be performed—but if a useful portion remain, leeches, &c. should first be tried in order, if possible, to remove inflammation. If a tooth is loosened by a blow, it should be fastened by silk to its neighbours. If a tooth is entirely driven out, it should be replaced as soon as bleeding has ceased, and be fastened in by silk; no food should be allowed that requires mastication, and inflammation should be combated by repeatedly leeching the gum.

XXIX. CARIES signifies a successive softening and decay;—strictly corresponding to ulceration. It generally begins at the surface of the bone of the tooth, and appears as a dark spot underneath the enamel, which after a time gives way and exposes a cavity. The disease gradually spreads and reaches the central

cavity of the tooth, which from that time is subject to fits of toothache. This disease may be caused, (1) by original weakness of the teeth, which is often hereditary, and appears to be connected with the strumous diathesis—the teeth being remarkably white and pearly. The profuse administration of mercury during early childhood is justly conceived to be another predisposing cause. (2.) Injuries to the teeth—the abrasion of their enamel—the use of very hot or very cold drinks—and especially of ices, are exciting causes. *Treatment.*—If the caries be slight and recent, the whole of the decayed portion should be removed by proper instruments, and the cavity be filled up with gold. This operation should not be performed, however, if the decay has advanced so far as to lay open the central cavity of the tooth,—or if the introduction of an instrument causes the peculiar pain arising from pressure on the nervous membrane. Such a proceeding would most probably cause excruciating agony, and induce suppuration in the centre of the tooth and in its socket. But if the tooth is merely slightly tender, it is probable that the repeated application of stimulants—especially of alchol, sp. camph., and solution of arg. nit. (℈ss ad ℥j)—a drop of either of which may be frequently introduced into the cavity, may cause absorption of the membrane, or diminish its sensibility, so that the stopping may after a time be performed without mischief. In general, however, when caries has made much progress, the only thing to be done is to avert toothache, and delay the necessity of extraction. The patient should avoid exposure to cold—or drinking very hot, or cold, or sweet, or acid fluids—he should be careful not to induce feverishness by any errors in diet, and should frequently cleanse out the carious cavity with the fluids mentioned above. A little lint or cotton, dipped in a strong solution of mastic, may be worn in it, if it can be done with comfort. A peculiar fungous excrescence occasionally grows from the lining membrane when exposed by caries. Sometimes it is indolent—sometime acutely sensible; but it always gives more or less annoyance in mastication. Extraction of the tooth is the only remedy.

XXX. TOOTHACHE.—(1.) The most common form of this affection is that which arises from *caries*—the lining membrane being rendered irritable by exposure, and being liable to nervous or inflammatory pain from any local irritation or disorder of the health. *Treatment.*—We may arrange the multifarious remedies for this form of toothache in the following order. (*a.*) *Purgatives* and low diet are indicated if the pain followed exposure to cold or excess at table, and if it is attended with foul tongue, hot skin, and headache. (*b.*) *Scarification* of the gums, or leeches to them or to the cheek, will be useful if the tooth is tender and the gums swollen. (*c.*) *Derivatives.*—Hot pediluvia—warm enemata—and rubefacients to the cheeks—especially ammonia and ether applied in the palm of the hand, are generally of service; and (*d.*) *Siala-*

gogues, especially ginger, cloves, and pellitory, or steaming the mouth with hot vinegar and water, are equally so. (*e.*) *Anodynes.*—A small quantity of laudanum, or of a solution of morphia, or a paste made with opii gr. j, camph. gr. iv—inserted into the tooth, are often of great benefit; but it is of no use to administer large doses of opium internally—they disorder the system without adequately relieving the pain. A drop of the hydrocyanic acid inserted into the hollow of the tooth, and two minims of the same, given every four hours in a saline draught, are the best remedies of this class. (*f.*) *Stimulants*—such as the essential oils of cinnamon, origanum, cloves, and the like,—creosote,—solution of nitrate of silver,—alcohol,—diluted hydrochloric acid (℥ß ad ℥ii aquæ)—solution of alum in nitric ether (℥ß ad f℥ß,)—very hot or very cold water,—are popular remedies, whose efficacy is supposed to depend on their exhausting the sensibility of the nerve. (*g.*) *Cauterants.* It has been proposed to introduce the concentrated sulphuric or nitric acids, or a red hot wire, into the carious cavity, in order to disorganise the nervous pulp. One author has recommended it to be broken up by a sharp steel punch. But these remedies can scarcely ever be applied with a certainty of accomplishing their object—if they do not cure the toothache, they will be sure to aggravate it,—and in the hands of a bungler they might be productive of very great mischief.

(2.) *Inflammation* of the lining membrane sometimes affects a tooth that is apparently sound. It occasions severe, heavy, throbbing pain extending to the head, and considerable tenderness of the tooth and of the gum around. It may lead to suppuration of the pulp, or to abscess in the alveolus, and death of the tooth in consequence. *Treatment.*—Leeches, low diet, and purgatives.

(3.) *Neuralgic* toothache, whether it occurs in teeth that are entirely sound or partially carious, is to be distinguished by its occurring in paroxysms which come and go suddenly, in more or less regular intervals. It is very common in the earlier months of pregnancy. *Treatment.*—Quinine or the carbonate of iron in large doses, together with aperients and alteratives, are the most successful remedies.

(4.) *Exostosis*, a deposit of bone on the root of a tooth, occasions severe pain that can hardly be distinguished from the last. It sometimes occurs on teeth that are perfectly sound, but more generally on those that are carious. The excessive pain of this affection is in general only to be relieved by extraction.

XXXI. Necrosis.—a tooth becoming black and unsightly, and gradually loosening in its socket from absorption of its roots, may be a consequence of blows which have torn across the nutrient vessels,—or of inflammation of the pulp, (perhaps from the abuse of mercury.) Extraction must be performed, if the tooth cause inflammation or other inconvenience.

XXXII. Extraction.—Before extracting teeth, it is usual to

cut away the gum from their necks by means of a gum lancet;—a practice which some authorities consider unnecessary. It is, however, neither to be indiscriminately adopted, nor altogether rejected. It certainly is unnecessary in the majority of cases, especially for the extraction of the temporary teeth, and of the teeth of old persons;—but it should be performed, 1st, if the gum has been subject to repeated inflammation—which renders it adherent to the tooth, and liable to be lacerated on its removal; 2ndly, to afford room for the extracting instrument, if the tooth has decayed down to the gum. Some persons, instead of using a lancet, separate the gum by means of a small tenaculum, and it certainly is less painful and equally efficacious.

The instruments for extracting teeth are the forceps, the key, and the elevator. In using the forceps, it is necessary to obtain a firm hold of the tooth, as near the neck as possible, but not to press the blades together too forcibly, otherwise the tooth may be crushed. One very simple precaution is necessary in using the key;—that is, to rest the fulcrum on the edge of the alveolar process; and in fixing the claw on the tooth, to place its point on a rather lower level than the fulcrum, *i. e.* rather nearer the root of the tooth. It may readily be understood that by this means, when the instrument is turned, the tooth will be drawn more or less perpendicularly from its socket; whereas if the fulcrum be placed on a lower level (or nearer the root of the tooth) than the claw, the tooth will be drawn altogether sideways, and there will be danger either of breaking it off, or of splintering the alveolar process, or of snapping through the claw. In order to use the elevator, its point must be thrust down between the tooth and the socket, and then by bringing the instrument into a horizontal position, and making a fulcrum of the edge of the alveolar process, or of an adjoining tooth, or sometimes of the operator's fingers, the tooth will be lifted out.

Extraction of the temporary teeth may be readily performed with forceps,—using a straight pair for the upper jaw, and a curved for the lower.

The permanent incisors and cuspidati of the upper jaw may be extracted by straight forceps, giving a slight turn first, and then pulling directly downwards. The same teeth in the lower jaw are most conveniently removed by the *hawksbill forceps*, an instrument which opens vertically, and is so called because one blade overlaps the other, like the beak of a carnivorous bird,—but the straight or common curved forceps (which open laterally) may be used if preferred. As the roots of these teeth are flattened, they cannot be twisted, but must be dislodged by a slight antero-posterior motion, before drawing upwards.

The bicuspides and molares are most easily extracted with the key. The fulcrum ought to be placed on the inner side for those of the upper jaw, and for the bicuspides of the lower jaw,—but on

the outer side for the molares of the lower jaw. The *dentes sapientiæ* of the upper jaw should never, according to Bell, be extracted with the key, because of the delicate texture of the bone on which the fulcrum must rest.

Roots and stumps may be removed sometimes with the key, sometimes with the elevator, sometimes with Shepherd's forceps, which have cutting edges that may be thrust up under the gum, so as to seize the part close to the alveolar process.

This operation is sometimes followed by very severe and dangerous hæmorrhage. In order to suppress it, the bleeding alveolus is first to be cleansed from coagulum,—then one end of a long thin strip of lint is to be firmly pressed into it, so as to come into contact with its very bottom, and the remainder in successive portions is to be forced in till the socket is filled up to the level of the gum. A compress should then be placed on the part, thick enough to be pressed upon by the antagonist teeth, and the mouth should be kept firmly closed by a bandage passing from under the chin to the vertex.

XXXIII. TARTAR, or *salivary calculus*, is an earthy matter deposited on the teeth from the saliva. It is found most abundantly on the superior molares and inferior incisors,—obviously because those teeth are nearest the orifices of the salivary ducts. If suffered to accumulate, it causes inflammation and absorption of the gums, and gradual loosening of the teeth. *Treatment.*—The deposit of this substance is to be prevented by taking care not to disorder the stomach, and by the strictest cleanliness. The teeth should be cleaned at least twice a day, and a soft toothpowder with a little soap should be used twice a week. The hairs of the toothbrush should be soft, and not too closely set;—so that they may penetrate the better into the interstices of the teeth. When any quantity of the tartar has accumulated, it should be removed by the *scaling instruments*. The edge or point of the instrument is to be introduced between the concretion and the gum, so as to detach the former in flakes,—in the meanwhile a finger or thumb, guarded with a towel, should be pressed firmly on the cutting edges of the teeth, so that they may not be loosened by the force necessarily employed. Sometimes a small portion of this substance is found sticking in the orifice of one of the salivary ducts, and creating great discomfort by its irritation. It may be easily removed.

XXXIV. INFLAMMATORY ABSORPTION, vulgarly called *scurvy* of the gums, generally affects middle-aged or elderly people, and may be a consequence of the accumulation of tartar, but more frequently depends on a congested state of the liver and bowels. The gums are swollen, spongy, exceedingly tender and subject to constant aching pain, and they bleed on the slightest touch. If the disease proceeds, they separate from the teeth;—the alveoli gradually become absorbed, the teeth loosen, and at last fall out.

These consequences are sometimes speedy, and are attended with suppuration in the alveoli, but more frequently they are slow—the teeth dropping out one by one in the course of years. *Treatment.*—The gums should be unloaded by deep and free scarifications and repeated leechings,—the bowels should be well cleared by a course of purgatives and mercurials,—and gargles should be employed to correct the secretions of the mouth, and excite the vessels to contract. Whilst there is much pain and soreness, dec. papav. vel anthemid., or three drachms of nitre dissolved in a pint of barley-water, will answer best. Subsequently, recourse may be had to F. 39, or to gargles of dec. cinchon. with alum or dilute sulphuric acid and tinct. myrrhæ,—or of liq. calcis chlorid. f℥j to half a pint of brandy and water.

XXXV. GUM BOIL (*alveolar abscess, parulis*) is a small abscess, commencing in the socket of a tooth, and bursting through the gum, rarely through the cheek. It is usually caused by the irritation of a dead or carious tooth. *Treatment.*—Leeches and fomentations,—removal of the tooth,—and a puncture as soon as matter can be detected. If the tooth is extracted soon, the sac of the abscess very often comes away with it.

XXXVI. EPULIS is a tumor formed by a growth of the gum, without any apparent alteration in its structure. It generally commences between two teeth, which it gradually separates, then loosens, and finally displaces,—and may spread so as to involve several of them. This tumor is indolent, painless, and of slow growth. *Treatment.*—The tooth on either side must be extracted, and the tumor be entirely cut out. A portion of the alveolar process must be removed likewise, if necessary, in order to render the extirpation complete.

A similar tumor is sometimes formed when a dead portion of the root of a tooth remains in its socket, and the gum has healed over it. The tumor should be entirely removed with the knife, and the extraneous body should be sought for, and be extracted if possible. *Malignant tumors* of the gums are exceedingly rare; they will, however, be recognised by their rapid growth and tendency to hæmorrhage.

XXXVII. TUMORS OF THE LOWER JAW may, like those of the upper, be either simple or malignant. Their distinctive characters have been before alluded to (p. 301.) Free extirpation is the only remedy. A tooth must be extracted on each side of the tumor,—the soft parts within and without are to be detached, and then the bone may be sawn through on either side. But if the tumor is not very extensive, it may be possible to leave a little rim of the basis of the jaw,—sawing the bone nearly through on both sides of the tumor, and then cutting out the intermediate portion with forceps. If a central portion is extirpated, including the attachments of the geniohyoidei and digastric, great care must be taken to counteract the retraction of those muscles and of the tongue, which might

cause suffocation. In removing a lateral portion of this bone, an incision should be made beneath its basis;—this will afford a perfect view of the tumor, and the cicatrix will not be obvious afterwards. Disarticulation of either half of the bone is performed by making a curved incision from beneath the ear along the basis of the jaw, to the chin. The flap so formed is to be dissected up, and the masseter with it;—a tooth is to be removed, and the bone to be sawn vertically through;—the end is then seized and depressed, and the temporal muscle dissected from the coronoid process,—the pterygoid muscles and other internal attachments are then divided, and finally the ligaments of the joint. After bleeding has been restrained, the wound is to be closed by sutures excepting at the middle, where an aperture should be left for the ligatures, and to permit the escape of discharge.*

CHAPTER XV.

OF THE SURGICAL DISEASES AND INJURIES OF THE NECK.

I. ACUTE INFLAMMATION OF THE TONSIL is known by rapid swelling of the part, great pain in deglutition, and fever. It must be treated by leeches or bleeding, purgatives, gargles calculated to promote the secretion of saliva, (F. 39,) and the ordinary antiphlogistic routine. If the gland continue to swell, or if it occasion any embarrassment to the breathing, an incision should be made into it, to unload the vessels, and give exit to matter. The tongue should be depressed with one forefinger, whilst a straight bistoury, wrapped round with lint except an inch and a half of its point, is plunged directly into the tumor, and made to cut its way out towards the median line.

II. CHRONIC ENLARGEMENT is a frequent sequel of repeated inflammation of the tonsils, especially in scrofulous children. It causes sundry inconveniences. The parts are liable to repeated inflammation—deglutition is impeded—the voice is rendered hoarse—respiration is noisy and laborious, especially during sleep—there

* Vide Liston's Elements of Surgery, and Practical Surgery, 2nd ed.; Copland's Dict., art. Hæmorrhage; Sir A. Cooper's and Lawrence's Lectures; Guthrie in Med. Gaz., vol. xvii.; Brodie, *ibid.* vol. xv.; Liston on Tumors of the Face in M. C. T., vol. xx.; James on Inflammation, p. 527, (*cancer oris;*) Bell on the Teeth; and Jobson on the Teeth.

is more or less deafness from the obstruction of the eustachian tubes —and suffocation has even been caused by viscid mucus entangled between the swollen glands. *Treatment.*—In the first place, the system must be strengthened, and the secretions be kept up by proper tonics and alteratives. The iodide of iron, the combination of corrosive sublimate with tinct. cinchonæ, and other remedies mentioned at p. 183, may often be administered with benefit. At the same time absorption of the tumor must be promoted by astringent gargles (of dec. cinchon., with alum, &c.)—by washing it once a day with strong lotions of arg. nit., or cupri sulph. on a hair pencil—by applying stimulating, or mercurial, or iodu-retted liniments and ointments to the skin;—and by lancing the gums over the wisdom teeth if tumid, and removing any decayed teeth that cause irritation. But if these measures fail, part of the gland should be removed with the knife—a much more expeditious and cleanly method than the ligature. The surgeon seizes the tumor with a hook, or *vulsellum*, (depressing the tongue with its handle,) then introduces a blunt-pointed knife, and shaves it off —cutting upwards, parallel to the isthmus faucium.

III. ENLARGEMENT OF THE UVULA produces tickling cough and expectoration by irritating the larynx. If it does not yield to the treatment directed for enlarged tonsil, it should be cut through in the middle with a pair of long scissars, being stretched and steadied with forceps.

IV. POLYPUS GROWING FROM THE EPIGLOTTIS has been known to produce fits of suffocative spasm of the muscles of the glottis, which have proved fatal. Any such tumor, if ascertained to exist, must be removed.

V. SPASM OF THE ŒSOPHAGUS (*spasmodic stricture*) is known by its generally occurring in sudden fits—the patient at a meal finding himself altogether incapable of swallowing—and the attempt to do so producing spasmodic pain and a sense of choking. The bougie, if passed, either meets with no obstruction, or with one that very easily yields. *Treatment.*—This affection always depends on a weakened or hysterical state of the system, or on the presence of some other disorder, as has been mentioned at p. 258. Brodie relates a case that ceased on the removal of bleeding piles; and Mayo, another that was cured by relieving chronic disease of the liver. Tonics, anti-spasmodics, and alteratives—exercise in the open air, the shower-bath, and other forms of warm and cold bathing—great attention to the diet—care not to swallow anything imperfectly masticated or too hot, and the occasional passage of a bougie, are the remedies.

VI. PALSY OF THE ŒSOPHAGUS occasions inability of swallowing, but without pain or other symptoms of spasm; and a bougie, when passed, meets with no obstruction. It generally depends on organic disease of the brain or spinal cord, which must be examined into and cured if possible. The patient should be fed by the

stomach-pump, by nutrient enemata, and by pushing soft food occasionally down the œsophagus with a probang. The palsy has sometimes been temporarily relieved by electrifying the patient on an insulating stool. Nutrient enemata should be composed of very strong beef or mutton broth, without salt or spice, and with ten or twenty drops of laudanum. The quantity injected at one time should not exceed four ounces.

VII. DILATATION AND SACCULATION.—The œsophagus has been found after death exceedingly dilated. The symptoms during life were, great *dysphagia*,—food, when swallowed, never seemed to reach the stomach, and was vomited in a few minutes. If this condition should be ascertained during life, the patient should be fed as in palsy. Sometimes a blind pouch is connected with the œsophagus, and occasions great distress in swallowing by intercepting the food. It may be formed either by a protrusion of the mucous membrane through the muscular fibres, or by the sac of an abscess which has burst into the tube. The only remedy is, to feed the patient constantly with the stomach-pump, so that the pouch may be allowed to close.

VIII. PERMANENT STRICTURE is a narrowing of the œsophagus, owing to an inflammatory thickening of its mucous and submucous coats, which form a firm ring, encroaching on the canal. It is generally found just below the termination of the pharynx; —and is most frequent in females. The *Symptoms* are, difficulty of swallowing—noticed probably for years—gradually increasing—never absent—and occasionally aggravated by fits of spasm. The act of swallowing frequently produces pain in the chest, shooting between the shoulders, and up to the head. When a bougie is passed, it meets with an obstruction, and displays the impression of the stricture on its extremity. The *causes* of this affection are not known—in one case it appeared to be induced by violent retching in sea-sickness. If unrelieved, its *consequences* will be ulceration of the œsophagus, either above or below the stricture, with salivation, — vomiting of purulent matter — impossibility of deglutition—and death—either from sheer starvation, or from the irritation of the local disease, or the extension of ulceration to the lungs. *Treatment.*—A mild course of mercury, so as just to affect the gums,—combined with hyoscyamus or conium, if there be much irritability—a seton between the scapulæ—and the occasional passage of a bougie, or of a *ball probang*—an ivory ball attached to a piece of whalebone or flexible wire—are the remedies. The method of introducing the bougie is as follows. The patient sits upright, with the head thrown back, and the mouth wide open. The bougie, which should be previously warmed in the hand and oiled, and gently curved, is passed down into the pharynx in such a manner that its point may slide along the vertebræ. In order that it may not excite cough by interfering with the epiglottis, the patient should be directed to protrude the tongue from

the mouth as far as possible;—or to perform the act of deglutition just when the bougie is entering the pharynx. If it meets with an obstruction to its descent, the surgeon should slightly withdraw it,—then again press it gently against the obstruction, increasing the pressure for a few minutes if it gives no pain. If it fail to pass, it should be taken out, and its point examined; and if it bear the impress of a stricture, a smaller one should be tried.

IX. SCHIRRHUS of the œsophagus produces the same symptoms as stricture, and must be treated in the same manner.

X. ULCERATION of the œsophagus is generally situated at its upper part, and on its posterior surface. It causes great *dysphagia*, and burning pain on the passage of food. If a bougie is passed, it meets with one obstruction just above the ulcer, and with another just below it,—and its point returns marked with bloody pus, and presenting the ragged impression of the ulcer. *Treatment.*—Alteratives, counter-irritants, and nutrient enemata. The burning pain is sometimes relieved by swallowing small quantities of iced cream.

XI. TUMORS pressing on the œsophagus—abscesses, aneurisms bronchocele, or enlargement of the bronchial glands, will produce all the symptoms of organic stricture. Aneurisms and abscesses have been burst by the passage of bougies—with, of course, instant death in the former case, and relief in the latter. Before performing this operation, therefore, the chest ought to be well scrutinised by auscultation, to detect any unnatural pulsation or *bruit;* and any signs of embarrassed circulation or respiration should not be overlooked.*

XII. FOREIGN BODIES, when fixed in the pharynx, or about the aperture of the larynx, or in the œsophagus, produce a sense of choking, and fits of distressing suffocative cough, and may prove fatal either quickly from spasm of the glottis, or more slowly from inflammation of the parts—attended with exhausting cough and dyspnœa, and profuse fetid expectoration. *Treatment.*—The patient should be seated in a chair, with the head thrown back, and the mouth wide open. The surgeon should then introduce his finger—regardless of attempts to vomit—and should pass it swiftly into the pharynx, and search the whole of it thoroughly. When the substance is felt, it may perhaps be entangled in the point of the nail—or curved forceps may be guided to it by the finger. Pins or fish-bones are often entangled about the velum, or in the folds of mucous membrane between the epiglottis and tongue.

If the body has passed into the œsophagus, and it is small and

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* Vide Sir E. Home on Strictures, vols. i. and ii. Monro on the Morbid Anatomy of the Gullet, &c. Brodie on Local Nervous Affections, (*spasmodic stricture.*) Mayo's Pathol., and Stokes in Cyclop. P. M. vol. ii.

sharp, (a fish-bone for instance,) it may be got rid of by making the patient swallow a good mouthful of bread. If large and soft, (as a lump of meat,) it may be pushed down into the stomach with the probang. Large hard bodies, especially if rough and angular, (such as pieces of bone or glass, &c.,) should be brought up if possible. A pair of long curved forceps, or a piece of whalebone armed with a flat blunt hook, or with a skein of thread, so as to form an infinite number of nooses, are convenient instruments. If, however, it can neither be brought up nor down, and it be lodged in the cervical portion of the tube, it must be extracted by incision.

XIII. ŒSOPHAGOTOMY.—This operation should be performed on the side towards which the foreign substance projects. Its situation having been ascertained, an incision of sufficient length must be made through the skin and platysma between the sterno-mastoid muscle and trachea. The cervical fascia must next be divided on a director. The surgeon must then divide the cellular membrane with a blunt knife, or lacerate it with his fingers, avoiding the carotid and thyroid arteries, and the recurrent nerve. A common silver catheter may then be passed down the throat, and made to project in the wound, so that the œsophagus may be opened by cutting on it. The small wound in the œsophagus should be dilated with forceps, to avoid hæmorrhage, and the foreign body should then be extracted.*

XIV. Whenever a foreign substance is impacted in the *rima glottidis*, and cannot be immediately dislodged, or if suffocation appear imminent, tracheotomy, or laryngotomy, should be immediately performed, both to allow of respiration, and that a probe may be introduced to push the substance up into the mouth. But, before doing so, the pharynx should (if the delay is inadmissible) be searched with the fingers, and the œsophagus with a probang.

When a body has passed the *rima glottidis*, it may (1) be entangled in the ventricles of the larynx, producing spasmodic cough and dyspnœa, with a croupy sound during respiration, and loss of voice; or (2) it may be loose in the trachea. In this case uneasiness generally subsides for a time; but every now and then there are violent fits of coughing, during which the substance may be heard, or may be felt by the finger to be forcibly impelled against the upper part of the larynx. (3) It may have passed into one of the bronchi, (generally the right,) where it may perhaps be detected by causing a whistling or murmuring sound; but the diagnosis will often be obscure.

XV. LARYNGOTOMY AND TRACHEOTOMY.—The former of these operations is most quickly and easily performed, and is to be preferred in sudden emergencies, but the latter most readily admits

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* Vide Arnott on Œsophagotomy, M. C. T. vol. xx.

of the removal of foreign bodies, and is always to be chosen in cases of suffocation from disease.

Laryngotomy is performed by cutting at once, or pushing a trocar through the *crico-thyroid* membrane, which may be felt as a soft depression, an inch below the *pomum Adami*.

Tracheotomy is thus performed. The head being thrown back, an incision, an inch and a half to two inches long, must be made exactly in the median line from the cricoid cartilage to the top of the sternum. The skin, superficial fascia, and fat, are then divided; the sterno-hyoid muscles are separated with the point of the knife; the loose cellular tissue and veins are cleared from the front of the trachea with the fingers or handle of the scalpel; the thyroid gland, if in the way, is pushed up; then the patient being told to swallow, the surgeon seizes the moment, and whilst the trachea is stretched, sticks in his knife at the bottom of the wound, and carries it upwards, so as to divide three or four of its rings. The foreign body is then usually expelled with a strong gust of air; but if not, it must be searched for with a probe, and be removed by forceps, or by a blunt hook. The wound may be closed by plaster when bleeding has ceased, but not before. If the operation were performed for the relief of dyspnœa, a *conical* curved tube should be introduced for the patient to breathe through. From its shape, it fits tightly into the aperture, and prevents the entrance of blood into the trachea. When the patient wishes to cough, or speak, he must be taught to close its orifice with his finger. It should be frequently cleared of any mucus that may lodge in it.

XVI. SCALDS OF THE GLOTTIS, through swallowing boiling water or corrosive fluids, produce the ordinary symptoms of laryngitis—suffocative cough, and dyspnœa. *Treatment.* — Leeches, ice to the throat, calomel in large doses, so as rapidly to affect the system, and tracheotomy if required.

XVII. HANGING may destroy life in three ways. (1.) By dislocating the neck. (2.) By compressing the trachea, and suspending respiration. (3.) By compressing the jugular veins, and inducing apoplexy. *Treatment.*—Artificial respiration, bleeding from the jugular vein, if the face be turgid, and affusion of cold water on the face and chest.

XVIII. DROWNING, *Treatment of.* If respiration has ceased, it should instantly be commenced artificially; at the same time the body should be wiped dry, and be assiduously rubbed with hot cloths. Hot bricks and bottles of hot water should be put into the axilla, between the thighs, and to the feet; the head should be raised, the nostrils irritated with a feather, or with the fumes of hartshorn, and a warm enema of turpentine may be thrown up. It need scarcely be said that enemata of that filthy narcotic, tobacco, must not be thought of. As soon as the patient can swallow, he should have some weak wine and water; and soon afterwards an

emetic of mustard, to clear the stomach of the water which he has swallowed, and to restore the circulation by the impetus of vomiting. After some hours he will suffer from severe headache and fever, which must be relieved by bleeding, or leeching, purgatives, and other remedies, according to the exigences of the case.

XIX. ARTIFICIAL RESPIRATION is required in all cases of suspended animation,—whether from external injury, noxious gases, or narcotic poisons, including alcohol. It may be performed by passing a pipe through the mouth, or a male catheter through the nostril into the glottis, or by simply putting a pipe into one nostril, and closing the mouth and the other nostril, and blowing through it. But it is a better plan to use a small pair of bellows, putting its muzzle into one nostril. The operator should be careful to force the air into the lungs with very great gentleness, and to press the larynx against the spine, so that it may not go down the œsophagus. If the larynx has been crushed by a rope, or by a violent blow, it may be necessary to perform tracheotomy, but not otherwise.

XX. STOMACH-PUMP.—The tube of this instrument is to be introduced in the same manner as the œsophagus bougie. It is usual to place a gag in the patient's mouth, having a hole for it to pass through, in order that it may not be compressed by the teeth. Before pumping out the contents of the stomach, one or two pints of water should be injected into it, and care should be taken *not to withdraw quite as much* as was injected. More water should then be thrown in, and the process should be repeated till it returns colourless.

The stomach-pump is by no means so universally efficacious as is popularly supposed. It ought only to be employed in those cases of poisoning by opium, or alcohol, or other narcotics, in which the stomach and nervous system are rendered so insensible that vomiting cannot be excited. For, in the first place, the operation is not free from danger. It is a well-established fact, that a tube may sometimes be passed into the trachea of a sensible person without creating any peculiar sensation, or exciting cough; but if the patient be insensible, that accident will be much more liable to happen. In fact, a case is on record in which a meddling surgeon, with more zeal than knowledge, did actually pass the tube down the trachea, and inject the lungs with chalk mixture. Again, it is known that in one case the mucous membrane of the stomach was sucked into the holes of the tube, and torn into strips,—a thing likely to happen if the stomach is pumped too empty. Besides, this artificial evacuation of the stomach is by no means so efficacious as free vomiting, assisted by plenty of diluents. Lumps of arsenic were left in the stomach in the very case just cited, in which the mucous membrane was torn. But yet surgeons have been reprimanded by attorney-coroners and "respectable" juries for not using this instrument, even in cases

in which it must have been either useless or injurious. These are the fruits of permitting the office of coroner to be filled by men who have no knowledge of the subjects that they are required to sit in judgment on.*

XXI. WOUNDS OF THE THROAT are generally made with intention of suicide, and are extremely dangerous, no less from the importance of the parts injured, than from the despondency of the patient. *Treatment.*—The general indications are, 1st, to arrest hæmorrhage; 2ndly, to obviate difficulty of breathing; 3rdly, to prevent inflammation.

In the first place, any arteries that are wounded must be tied, and hæmorrhage from large veins must be restrained by pressure with the finger, kept up as long as may be necessary. The patient should be put to bed in rather a warm room; and as soon as all oozing has ceased, but not before, his shoulders should be raised by pillows, and the head be bent forwards, and confined by a bandage passing from each side of the nightcap to the shoulders. Plasters are inadmissible, and so are sutures, except in the cases that will be alluded to presently. If the wound penetrates the trachea or larynx, it should be covered with a loose woollen comforter, or with one of Jeffrey's respirators after the first week, if it can be nicely adapted. The patient should not be kept too low, and if the pharynx or œsophagus is wounded, a common, large-sized, elastic catheter may be passed, through which nutritive fluids can be injected by means of an elastic bottle. But if during the inflammatory stage the attempt causes great irritation, it may be necessary to employ nutrient enemata merely. No tubes should be passed through the wound for that purpose. The great thirst and dryness of the fauces, experienced in these cases, may be in some measure mitigated by sucking a wet rag. If the patient finds great difficulty in expectorating through the wound, he must be taught to close it partially by leaning his head forwards and placing his fingers on it, so that he may expel the air with a sudden gust.

In every stage of the cure, difficulty of breathing should be viewed with suspicion. (1) If the wound is above the larynx, it may be caused by the epiglottis being detached from the tongue, and hanging down upon or irritating the *rima glottidis*, or by clots of blood collecting in the pharynx. (2) It may be caused by an irregular and jagged division of the larynx or trachea, so that some pieces of the cartilage hang into the tube;—or by a complete division of the trachea, and the aperture of the lower portion being overlapped by the upper. In these cases it may be requisite to employ sutures, but they should be passed merely through the cellular tissue around the cartilage, and neither through the cartilage nor the

* Vide an amusing Clinical Lecture on the Abuse of the Stomach-Pump, by Professor Watson, in Lond. Med. Gazette, vol. xvii., and Roupell's Illustrations of the Effects of Poisons.

skin. (3) It may be caused by swelling of the mucous membrane of the larynx and trachea in the acute inflammatory stage,—or by chronic thickening of that membrane from the continued irritation of cold air, if the wound is very slow in closing. In the former of these cases, free antiphlogistic measures must be used;—the latter must be prevented by using a proper position, so as to promote the approximation of the wound whilst it is healing;—in both it may be necessary to make a longitudinal division of the trachea to relieve the dyspnœa. (4) Another frequent cause of dyspnœa is the passage of blood into the trachea, if the wound is prematurely closed, and especially if it is sewn up or covered with plasters. Even supposing the trachea not to be opened, great danger may result from closing a wound of the throat before bleeding has ceased, for the blood may accumulate and coagulate, and compress the trachea.

XXI. Bronchocele (*Goitre, Derbyshire neck*) is an hypertrophy of the thyroid gland. *Symptoms.*—A soft, projecting, elastic, tumor occupies the front of the neck, in the situation and of the shape of the thyroid gland. It is rarely tender, and the skin is not discoloured. Frequently one lateral lobe is larger than the other;—and occasionally the middle lobe or isthmus is solely or principally affected. *Consequences.*—It rarely causes any inconvenience;—except occasional headache, and difficulty of breathing in a stooping posture. But when very large, it may produce a most dangerous difficulty of swallowing and breathing, and congestion in the head by its pressure on the trachea, œsophagus, and jugular veins. *Diagnosis.*—It is to be distinguished from encysted and other tumors by its shape and want of fluctuation, and by mostly affecting both sides. *Prognosis.*—If it be soft and recent, and occur in a young patient, it will most likely be cured; but probably not, if it be old, hard, and the patient advanced in life. *Anatomical Characters.*—The cells of the gland are found enlarged;—of various sizes from that of a pea downwards;—and filled with a viscid fluid, which becomes gelatinous if immersed in alcohol. Hence it has been presumed that the disease consists essentially of an increased secretion of the matter contained in the cells of the gland. Sometimes they are filled with blood. In old cases, the tumor becomes hard, resembling a sarcomatous formation; and may contain ossific deposits.* *Causes.*—Bronchocele is extremely prevalent in Derbyshire, Nottingham, and the chalky parts of England generally,—but, above all, in the Tyrol and valley of the Rhone. The use of water impregnated with calcareous (or, as a late writer has surmised, *magnesian*) particles, to which the inhabitants of all those places are more or less habituated, although not perhaps the invariable cause, is the most probable that can be assigned. In England it

* Vide Baillie's Morbid Anatomy, by Wardrop, 2nd ed. p. 84, and Turner's Art of Surgery, vol. i. p. 198.

most frequently affects females about the age of puberty, and in many cases is obviously connected with uterine derangement. Patients so often refer its origin to some twist or strain of the neck, that there is some reason for believing that such an accident may be an exciting cause. *Treatment.*—The best remedy for this disease is iodine. The dose should not be large enough to cause pain or disorder of the stomach, or any diminution of the general health. The tincture of pure iodine is objectionable, because it is not miscible with water, and is apt to cause pain in the side. The iodine should be combined with an alkali, or with the iodide of potassium, or with iron; and an aromatic or a little hyosciamus often makes it sit more lightly on the stomach, (F. 40, 41.) Before administering these remedies it is useful to apply leeches, and purge the patient freely. An ointment or liniment of iodine, or iodide of potassium, may be rubbed into the tumor, but it will most likely enlarge the faster if the skin be irritated. The patient, if possible, should remove from a residence in which the malady is prevalent, and should drink boiled or distilled water. A residence on the coast and warm sea-bathing are mostly advantageous. If the iodine does not succeed, the burnt sponge, in doses of ʒß ter die, is the best substitute. Any disorder in the digestive or uterine organs should be carefully removed. Pills composed of aloes, soap, and assafœtida (aā gr. ii—iii.) may often be given at bedtime with advantage. Other remedies which were in vogue before the discovery of iodine, and which may be resorted to if that fails, are as follow—mercury, iron;—potass and soda;—chlorides of barium and calcium;—digitalis, hyoscyamus, and belladonna;—and sea water.

If medicines prove ineffectual, and the tumor enlarges rapidly so as to threaten suffocation or apoplexy, surgical operations must be resorted to. There are three which have been proposed and practised:—viz. the introduction of setons;—ligature of the arteries which supply the gland;—and extirpation. All of them have at different times succeeded;—all of them are hazardous to life, and have proved fatal;—and the two first have in some instances failed to remove the disease, although the patient has recovered with his life.

If a *seton* be passed, it should be of silk, and large enough to fill the wound made by the needle, so that there may be no fear of bleeding. The needle should be long and narrow. The utmost precaution must be taken, both before and after the operation, to avoid inflammation. If after the seton has remained for some time, it ceases to produce a diminution of the gland, it should be withdrawn, and re-introduced in another place.

Extirpation of the gland is performed by making an incision in the mesial line of the neck;—the skin and muscles must then be dissected from the tumor;—and every artery be tied as soon as it is divided. Then (as it is mostly enlargement of the isthmus, or middle lobe, that requires this operation) a strong

double ligature should be passed through it, and should be firmly tied on each side of it before it is cut out.

Sometimes *cysts* are formed in this gland, which contain a glairy matter or blood. If necessary, they may be punctured;—when they will most likely inflame, suppurate, and contract. If bleeding prove troublesome, the wound must be filled with lint.

This gland may further be affected with acute or chronic *inflammation*, and tubercular deposit; either of which may lead to abscess. Their *treatment* must be conducted on general principles.

XXIII. HERNIA BRONCHALIS, (*Bronchocele vera, Goître aerien,*) is a very rare tumor, formed by a protrusion of the mucous membrane through the cartilages of the larynx, or the rings of the trachea, and caused by violent exertions of the voice. Larrey met with sundry instances of it in French officers, and in the priests that call the people to prayer from the top of the minarets in Mohammedan countries. The tumor is soft and elastic,—can often be made to disappear by pressure,—and is increased by any exertion. The only available treatment is moderate support.*

XXIV. PAROTID TUMORS.—The parotid gland is occasionally, although rarely, the seat of malignant disease, and perhaps of sarcomatous enlargement. But the tumors behind the ramus of the jaw (commonly called *parotid tumors*) generally depend on disease of the lymphatic glands, which are embedded in the parotid, and which cause the natural texture of the latter to be displaced or absorbed, so that they may extend inwards to the pterygoid and styloid processes, and be intimately connected with the branches of the *portio dura*. "If there be reason to suspect," says Mr. Liston, "that the disease is of a malignant nature, and not thoroughly limited by a cellular cyst, no interference is admissible. If, on the contrary, it be at all movable, has advanced slowly, possesses a smooth surface, and is firm, (neither of stony hardness, nor pulpy,) then an operation may be contemplated."

XXV. TUMORS IN THE SIDE OF THE NECK, if subjacent to the skin merely, may be readily removed,—but if they lie deeply, and are bound down by the platysma and fascia, require some consideration. If a tumor be of slow growth, defined in its outline, and movable, so that it is probably not malignant,—or if it interferes with deglutition or respiration, its extirpation may be attempted. The patient should always be warned of the probability of facial palsy after removal of a parotid tumor. See the remarks on the removal of tumors in Part VI.

XXVI. WRYNECK is a peculiar distortion in which the head is bent down towards one shoulder, (generally the right,) and the face is turned to the opposite. The right eyebrow and right corner

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* Clinique Chirurgicale, tom. ii. p. 81. Paris, 1829.

of the mouth generally become elevated, so as to preserve their horizontal position, notwithstanding the distortion of the neck.

Varieties.—(1) This affection may perhaps be only a part of general lateral curvature of the spine. Or (2) it may depend on caries of the cervical vertebræ. (3) It may be caused by contraction of the cicatrix of a burn or ulcer; or (4) by glandular enlargement on one side of the neck;—the treatment of which cases requires no observations in this place.

But the genuine wryneck is produced by permanent contraction of one sterno-mastoid muscle,—which may depend (1) On *inflammatory spasm* of that muscle, with or without subacute inflammation of the cervical fascia. This form generally occurs somewhat suddenly in weakly children with disordered digestive organs. The skin over the muscle is often hot and tender, and any motion causes pain. *Treatment.*—Perfect rest in the horizontal posture,—leeches,—and poultices or hot fomentations, so as to keep the skin constantly moist and perspirable,—with purgatives and alteratives.*

(2) It may depend on *rigid atrophy* of the muscle, (p. 200,) which may be a sequel of the state last described, or of habitual contraction from any of the preceding varieties,—or may be congenital. *Treatment.*—Long-continued friction with mercurial ointment, or with the lin. hydrargyri,—or Scott's ointment (F. 25) worn as a plaster,—with blisters behind the ears, and to the nape,—and the use of a machine to keep up extension,† may be of service in cases that are of no very long duration. If they fail, or if the case is congenital, division of the sternal (or perhaps of both) origins of the muscle is the last resource. It is best performed thus: The skin covering the muscle at about an inch from the sternum is to be pinched up between the left forefinger and thumb. A narrow curved bistoury is then to be thrust under the muscle, and made to divide it from behind as it is being withdrawn, but the wound in the skin must only be large enough to admit the instrument. The aperture may be made at the anterior border of the right muscle, and between the sternal and clavicular portions of the left. As soon as the division is complete, the ends retract with a dull snap, and the thumb should be pressed on the part, to prevent effusion of blood under the skin. When the wound has healed, but not before, an apparatus should be applied to elongate the callus, and restore the neck to its proper position. A stiff collar to the diseased side is the simplest and best.

(3) Lastly, this distortion may be caused by *palsy* of one sterno-mastoid muscle. If the administration of remedies calculated to remove any existing disease in the head or back, and to improve

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* Vide Abernethy, Lect. xxxii., Renshaw's ed.; James on Inflam., 2nd ed., p. 484; and Brodie on Local Nervous Affections.

† See a plate in Cooper's First Lines.

the health,—and if strychnine, blisters, issues, and electricity fail, division of the sound muscle has been recommended.*

CHAPTER XVI.

OF THE SURGICAL DISEASES AND INJURIES OF THE CHEST.

I. PNEUMOTHORAX—distension of the cavity of the pleura with air, and collapse of the lung, is known by more or less dyspnœa—absence of the respiratory murmur, with an exceedingly clear sound percussion, and immobility of the ribs on the affected side—and the *respiration puerile* on the other. It may be caused (1) by a fractured rib which has lacerated the lung—and in this case is attended with emphysema,—as has been detailed at page 219. (2.) It may be caused by the bursting of an abscess of the lung into the cavity of the pleura. This case will be indicated by *succussion* and by *metallic tinkling*, in addition to the signs mentioned above. *Succussion* simply consists in making the patient shake himself, when (inasmuch as both air and fluid have escaped from the lung into the pleural cavity) the fluid will be heard to splash, if the ear is applied to the chest. The *metallic tinkling* is a clear sound, like the dropping of water into a cask. It is produced when the patient coughs,—by which means a drop of fluid is shaken from the orifice in the lung, and made to fall to the bottom of the chest. *Treatment.*—If the breathing become very difficult from pneumothorax, a grooved needle or small trocar should be introduced between the fifth and sixth ribs, to let the air escape.

II. HÆMOTHORAX, the presence of blood in the pleural cavity, may be suspected if great dyspnœa and dulness on percussion follow a fractured rib. The blood may proceed either from the intercostal artery, or from the lung. *Treatment.*—If the difficulty of breathing be very urgent, *paracentesis* must be performed, to let the blood escape.

III. HYDROTHORAX is indicated by great difficulty of breathing, especially when lying down—livid countenance—disturbed sleep—dulness on percussion—and if the effusion be confined to one side of the chest, there is very great difficulty in lying upon the other. *Treatment.*—If (which is exceedingly rare) the hydrothorax

* Vide Cases of Wryneck, &c., by Dieffenbach, in the Lancet for Sept. 1838.

were a *local* affection, depending on a sub-inflammatory state of the pleura, *paracentesis* might be advisable for the relief of dyspnœa. But if (as it is generally) it is a mere effect of organic disease of the heart or lungs, the operation would do no good. At all events, both sides of the chest must not be punctured.

IV. EMPYEMA,—abscess of the chest, or suppuration of the pleura,—is most frequently an effect of acute inflammation, whether idiopathic or caused by injury. It is known by dulness on percussion—gradually increasing enlargement of the side of the chest—separation of the ribs—dyspnœa—difficulty of lying on the sound side—and more or less œdema of the parietes of the chest. If left to itself, the abscess may point and burst between the ribs. *Paracentesis* is decidedly required, if the case be clear;—if it be not, two or three punctures may be made with a grooved or cataract needle, and a cupping-glass be applied over them to extract some fluid.

V. PARACENTESIS THORACIS is performed by making an incision an inch and a half long on the upper edge of the sixth rib, at or a little behind its middle. The intercostal muscles are then to be cautiously divided, and the point of the bistoury to be passed through the pleura. If fluid escapes from this puncture, it may be slightly enlarged. This operation is liable to be followed by many of the mischiefs that result from the opening of large chronic abscesses (p. 59.) The pleural cavity is incapable of contracting as the fluid escapes;—air consequently enters to supply its place, and causes irritation of the cyst, and putrefaction of its contents. The discharge becomes profuse and fetid, and the patient suffers severely from irritative fever, under which he may sink. It is therefore advisable to place the patient on the diseased side immediately after the puncture, so that the matter may flow out without the ingress of air—to close the wound with lint and plaster before too much has escaped—to bandage the chest—and to repeat the operation in a few days if necessary, instead of leaving the wound open.

VI. HYDROPS PERICARDII may occur under the same pathological conditions as hydrothorax, and may be combined with it. Its diagnosis is obscure. It may be suspected to exist, if the patient complain of constant weight in the præcordia, great dyspnœa, especially when lying on the back, and faintness upon exertion;—if there is great dulness of percussion, and manifest fulness over the region of the heart—if its pulsations are tremulous—and the circulation embarrassed. The operation of *paracentesis pericardii* has been practised, although it can rarely be of much benefit. It has been attempted in sundry cases of hydrothorax, which were mistaken for hydrops pericardii; but by a second lucky mistake the pleura was opened instead. It may (if thought advisable) be performed, either by making an incision opposite the heart's apex, and dividing the muscles and pericardium with the same precau-

tions as in paracentesis thoracis—or by first making an opening into the pleura, opposite the junction of the fifth or sixth rib with its cartilage—and then introducing the finger, feeling for the distended pericardium, and cutting into it with curved scissors.

VII. WOUNDS AND CONTUSIONS OF THE PARIETES of the chest require the same treatment, whether the ribs are fractured or not. A firm bandage (having an aperture to admit of the dressing of any wounds) must be applied to prevent motion of the ribs. Free venæsection must be employed to prevent inflammation;—the bowels must be opened, the diet low, and cough and irritation be allayed by opiates.

VIII. PENETRATING WOUNDS of the thorax, unattended with wound of the lungs, are exceedingly rare. In some cases, when the chest is laid open, the lung collapses, just as it would in a dead body; in others, on the contrary, it does not recede from, or it even may protrude out of the wound. If so, it must be immediately returned by gentle pressure. *Treatment.*—Bleeding must be restrained; foreign bodies, if any, removed, and the wound be closed; then free bleeding, and the other measures spoken of above. The *intercostal artery*, if wounded, must, if possible, be tied, the wound being enlarged for that purpose if necessary. If this cannot be done, pressure must be kept up on the bleeding orifice by the finger.

IX. WOUNDS OF THE LUNG are known by great dyspnœa and sense of suffocation, pallid and extremely anxious countenance, and especially by bloody expectoration occurring *immediately* after the wound—the blood being coughed up in florid arterial mouthfuls, mixed with occasional clots. The dangers of these wounds are threefold. 1st, The great *hæmorrhage*, which may destroy the patient by inanition, or may fill up the air passages and induce suffocation. 2ndly, *Inflammation*, which is sure to supervene from the injury, and may be aggravated by the irritation of clots of blood, or of other extraneous bodies. 3rdly, Profuse and exhausting *suppuration*, with cough, debility, hectic, and all the symptoms of phthisis. *Prognosis.*—This of course must be extremely guarded. But there may be good hopes of recovery after the third day is passed. Death is seldom caused after the first forty hours. *Treatment.*—The first indication is to check the hæmorrhage. This can only be done by abstracting a large quantity of blood from the arm, provided the patient be not already faint. Then the wound should be examined, and if it be of large size, or a gunshot wound, the finger should be introduced into it, to remove clots of blood, splinters of bone, or any other foreign substances that it may find. If it is not sufficiently large for this purpose, it may be dilated by a probe-pointed bistoury. At the same time, an intercostal artery, if wounded, should be secured. The wound should then be accurately closed with lint and plaster, and the patient should be suffered to lie as quiet as possible. He

should have plenty of cool air, and a very light covering. It is a general rule, in all injuries of the thorax and abdomen, to place him on the wounded side. In the course of a few hours the pulse will probably rise, and the pain, and cough, and spitting of blood return. Upon the first appearance of such symptoms, venæsection must be repeated, and it must, without hesitation, be resorted to again and again if they recur. The diet must be rigorously low; nothing but cold acidulated drinks—lemonade, or barleywater, with lemon-juice—can be allowed for several days; the bowels must be opened, and opiates, with or without digitalis, be given to allay cough and pain.

Secondary hæmorrhage, after wounds of the lung, may (1) be caused by inflammatory excitement; or (2) (if the wound be gun-shot) by the separation of the sloughs from the lung; or (3) from an intercostal artery that may have been brushed by the ball. Venæsection is the remedy for the first two cases, and the ligature, or pressure, for the third.

If, after the primary dangers of hæmorrhage and inflammation have ceased, and the wound has closed, there are rigors, dyspnœa, and other signs of *empyema*, *paracentesis* is requisite. And if they come on soon after the injury, it should be performed at the site of the wound; but if at a distant period, it should be done at the usual place, in order to avoid the adhesions that are sure to be formed near the wound.

Foreign bodies in the chest add greatly to the danger of exhausting suppuration, although patients have recovered for years with balls, or pieces of cloth, encysted in the lung or pleural cavity. In some cases, a ball has remained rolling loosely about in the pleural cavity. If any foreign body is detected, it should, if possible, be removed, and part of the upper border of a rib may be sawn away with Hey's saw, if necessary.

Some surgeons direct penetrating wounds of the chest not to be closed; or they even recommend tents or canulæ to be inserted, to provide for the escape of blood or matter. But it must be evident that there will be much less liability to severe inflammation if the wound is closed,—just as in wounds of joints and compound fractures. Besides, "if the patient," says Hennen, "is placed with the wound in a dependent posture, the exit of effused fluids is not necessarily impeded. If they exist in large quantity, the wound is effectually prevented from closing; if the flow is so minute as to admit of the union of the wound, the quantity effused is within the power of the absorbents to remove."

After wounds of the chest, there is a constant susceptibility of inflammation from slight causes, so that the patient should be cautious to avoid over-fatigue, intemperance, and atmospheric vicissitudes.

X. WOUNDS OF THE HEART generally prove fatal from hæmorrhage. Numerous instances, however, are on record, in which stabs

or musket wounds of this organ healed, both in man and animals, without any remaining ill effects. The diagnosis and prognosis will of course be extremely doubtful. The only available *treatment* is free depletion and opiates, in order to prevent hæmorrhage, and keep the circulation as quiet as possible.

CHAPTER XVII.

ON THE SURGICAL DISEASES AND INJURIES OF THE ABDOMEN.

I. PARACENTESIS ABDOMINIS is required in *ascites* and *ovarian dropsy*, when the abdomen is so distended that the breathing and the circulation of the lower extremities are seriously impeded. *Ascites* is known by the equable enlargement and fluctuation of the abdomen, and by the clear tympanitic sound produced by percussion of the anterior surface of its parietes, whilst the patient lies on his back. In *ovarian dropsy*, the swelling fluctuates less distinctly,—is evidently composed of distinct cysts, some of which feel more distended than others,—and a dull sound is emitted on percussion of the abdomen whilst the patient lies on her back. *Operation.*—The patient must be seated in a chair. A broad towel must then be passed round the lower part of the abdomen, and its ends be crossed behind and entrusted to two assistants, who are to be instructed to draw it tight and support the belly as the fluid escapes; otherwise, the removal of the compression to which the abdominal veins have been habituated would cause the blood to gravitate into them from the heart, and induce syncope,—or perhaps they might burst, and occasion a fatal hæmorrhage. A piece of flannel, broad enough to cover the whole abdomen, and having a notch cut out of it above and below, (and the edges sewn together afterwards,) is a good substitute for the towel. The surgeon then plunges a trocar and canula through the linea alba two inches below the umbilicus, (or perhaps it is better to make a cautious puncture with a lancet, and introduce a *blunt* trocar and canula,) —then he draws out the trocar, and receives the fluid into a proper vessel—the assistants drawing the towel tight as it escapes. The aperture is to be closed with lint and plaster,—and the patient to be put to bed with the towel fastened round the loins. A broad flannel roller should be substituted for it before she rises. If an old hernia co-exists with ascites, and the sac is much distended and preserves a free communication with the abdomen, it is a good plan to puncture the sac instead of the linea alba.

II. VIOLENT BLOWS from obtuse substances,—the passage of cartwheels, spent shot, and so forth, may cause (1) severe *concussion* and collapse, which may either speedily prove fatal,—or may pass off without further ill consequences,—or may be succeeded by inflammation, (p. 1.) (2) They may produce *laceration* of the bowels, or of the solid viscera—with effusion of blood or of their secretions into the peritonæal cavity. This may be suspected if the patient complains of excruciating pain radiating over the whole belly;—if the features are pinched, the belly soon swells, and the pulse is very small and tremulous. *Treatment.*—The patient must be suffered to lie quietly during the stage of collapse, without any officious administration of stimulants; and as soon as pain or vomiting comes on, he should be bled. Subsequently, bleeding, leeches, and fomentations to the belly to abate inflammation; and large doses of opium to support the system under the irritation, are the only available remedies. The bowels should not be disturbed either with purgatives or enemata for the first three days,—nor should any nutriment be taken, save very small quantities of the mildest fluids at intervals.

III. ABSCESSES between the abdominal parietes occasionally result from contusions or punctured wounds, and sometimes occur idiopathically. According to the principles laid down in a preceding page, (57,) they should be opened early, both because of the tendinous structures by which they are covered, and of the possibility that they might burst into the peritonæum.

IV. PENETRATING WOUNDS of the abdomen may be divided into, 1st, the simple; 2ndly, those complicated with wounded viscera; 3rdly, those complicated with protrusion; and 4thly, those in which some of the viscera are protruded and wounded likewise.

(1.) In the case of a simple wound of the parietes, the surgeon must first (if it be large enough) gently introduce his finger to ascertain that no part of the intestines is beginning to protrude;—then the wound must be closed by sticking-plaster; or by suture if it be extensive. If the epigastric artery is divided, it must be cut down upon and tied. (2) In the case of small wounds without protrusion, it will be often impossible to say whether the bowels are wounded or not, but the treatment must be altogether the same in either case. (*a*) Wounds of the *stomach* may be known by the situation and depth of the wound,—by vomiting of blood,—by the very great depression and collapse,—and by the nature of the matters (if any) that escape from the wound. (*b*) Wounds of the *bowels* may *perhaps* be known by the passage of blood with the stools,—or by fæcal matter escaping from the wound,—or by the above-mentioned symptoms of extravasation of their contents into the abdominal cavity. Fortunately, however, as Mr. Travers has shown, wounds of the stomach and intestines, unless very large, are not so liable to be attended with extravasation as was formerly thought. For, in the first place, the mucous membrane protrudes

through the muscular, so as to fill up a small aperture; and secondly, any tendency to extravasation is counteracted by the constant equable pressure of all the abdominal viscera against each other. The reparation of these wounds is simple. Lymph is effused, and glues the neighbouring parts together, and thus the aperture is circumscribed, and any future extravasation effectually prevented. (*c*) Wounds of the *liver*, if extensive, are, from its great vascularity, nearly as fatal as those of the heart. Small wounds may be recovered from. There will at first be symptoms of great collapse, which, if the patient survive, will be succeeded by severe sickness, pain in the liver, yellowness of the skin and urine, great itching, and a glairy, bilious discharge from the wound. (*d*) Wounds or rupture of the *gall bladder* are almost inevitably fatal, although there are one or two instances of recovery on record. (*e*) Wounds of the *spleen*, if deep, are also fatal from the great hæmorrhage that follows, although the whole organ has been removed from animals (and it is said from man) without much consequent evil. (*f*) Wounds of the *kidneys* are attended with bloody urine. They are exceedingly dangerous, first from hæmorrhage, next from violent inflammation with excessive vomiting; and lastly, from profuse suppuration, kept up by the passage of urine through the wound. Venæsection, very mild laxatives, the warm bath, avoidance of too much drink, very light dressings so as to admit of the flow of urine through the wound, and some unctuous application to prevent excoriation of the surrounding skin, are necessary measures. (*g*) Wounds of the *bladder*, if communicating with the peritonæum, are extremely dangerous, owing to extravasation of urine. In fact, unless there is an external wound through which it can escape, they are almost uniformly mortal. The catheter must be worn constantly.

(3.) If the intestines protrude, and are neither wounded nor gangrenous, they should first be freed from any foreign particles that stick to them, and then be returned as soon as possible. The patient should be placed on his back, with his shoulders raised, and his knees drawn up. If absolutely necessary, the wound must be a little dilated with a probe-pointed bistoury. Then the surgeon should return the bowel portion by portion, passing it back with his right forefinger and thumb, and keeping his left forefinger on that which is already replaced, to prevent it from protruding again. He should be careful to replace intestine before omentum, and the part that protruded last should be returned first.

(4.) If the stomach and intestines, when protruded, are found to be wounded, the wound should be sewn carefully up with a fine needle and silk by the *uninterrupted or glover's suture*, (p. 90,) in such a manner as to bring the edges into apposition, and prevent all extravasation between them. Then the part should be replaced, and the external wound be closed. The aperture in the bowel will be united, as in other cases, by the adhesion of contiguous

surfaces; and the silk employed in the suture will be detached by ulceration, and fall into its cavity. If, however, any part of the bowel protruded be much bruised or lacerated, or be gangrenous, it should not be returned, but be left hanging out, that an *artificial anus* may be formed.

The *after treatment* of all these cases is the same. The patient must be kept at perfect rest, and should lie on the wounded part, if such a posture be easy. Venæsection and leeches must be sedulously employed to avert hæmorrhage and inflammation, and the indication for bleeding must be taken rather from the stomach than the pulse. The latter will, from the nature of the parts inflamed, be small and perhaps weak—but if there be vomiting, bleeding may be performed without fear. Nothing but water should be given for three days, when the stomach or intestines are probably wounded; and purgatives and enemata should be abstained from. Subsequently oily enemata may be used.

V. ARTIFICIAL ANUS, a preternatural communication between the intestine and skin, may be a consequence of penetrating wounds —of abscess or ulceration—or of mortification of intestine in strangulated hernia. The external opening is irregular, everted, and red —and the surrounding skin excoriated. The aperture in the intestine adheres by its margin to the peritonæum, so that extravasation into the abdomen is prevented. That portion of intestine which is immediately above the aperture, and that portion which is immediately below it, meet at the artificial anus at a more or less acute angle—and present two orifices—one by which matters descend from the stomach, and another leading down the rectum. These two orifices are separated by a sort of crescent-shaped septum, formed by a projection of the mesenteric side of the bowel opposite to the aperture. Now it may readily be understood, that the greater the aperture in the bowel, the more acute will be the angle at which the upper and lower portions meet—and the greater will the septum also be—and that if the septum is large, it will act as a valve, and close up the orifice of the lower portion of bowel — causing any matters that come down through the upper portion to escape externally, instead of passing into the lower.

The *consequences* of this affection may be, 1st, that the patient may suffer from inanition, if the aperture is near the duodenum. 2ndly, that a portion of intestine may protrude and form a hernia, —besides the constant disgusting annoyance occasioned by the escape of fæcal matters and flatus. *Treatment.*—If the affection is of recent origin, and especially if it be consequent upon strangu-

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* Vide Travers on Wounds of the Intestines, Lond. 1812; and Hennen's Military Surgery.

lated hernia, the patient should remain in bed, and great care should be taken to keep the parts clean, and then, perhaps, the external aperture may contract and cicatrise. If the latter be very small, and if the passage between it and the bowel is of some length,—(a state of parts termed *fæcal fistula*,) something may perhaps be done by compression, and by engrafting a piece of skin over the aperture.

But if the loss of substance in the bowel is considerable, and the projecting septum large, the chance of recovery is not great. A pad of simple linen or lint may be worn to compress the aperture and prevent discharge from it—or sometimes a hollow truss with a leather nor horn receptacle may be used with advantage. Enemata are useful in all cases. Moreover, a tent may be thrust into both internal orifices in order to enlarge the lower one, and repress the septum, as proposed by Dessault. As a last resource, a small portion of the septum may be nipped and strangulated by the forceps invented by Dupuytren for that purpose.*

CHAPTER VIII.

OF HERNIA.

SECT. I.—OF THE NATURE AND TREATMENT OF HERNIA GENERALLY.

DEFINITION.—Hernia signifies a protrusion of any viscus from its natural cavity. But the term, employed singly, is restricted to signify protrusion of the abdominal viscera.

CAUSES.—The formation of hernia may be readily understood by considering that the abdominal viscera are subject to frequent and violent pressure from the diaphragm and other surrounding muscles—a pressure which tends to force them outwardly against the parietes of the abdomen. Consequently, if any point of the parietes be inadequately strong to resist this pressure, some portion of the viscera may be forced through it, and form a hernial tumor externally.

The *predisposing* cause, therefore, is deficient resistance of the abdominal parietes—whether a result of natural structure, (as the

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* Vide the chapter on Artificial Anus in Lawrence on Hernia, and Dupuytren in Dict. de Med. tom. iii.

inguinal and crural rings,) or of malformation—or of injury or diseases, such as abscesses, wounds, and bruises—or of distension by the pregnant uterus, or dropsy. The *exciting* cause is compression of the viscera, by the action of the muscles that surround them. Hence hernia is so frequent a result of violent bodily exertion—lifting heavy weights and the like—especially if the patient have been previously weakened by illness. Moreover it is not uncommon in persons afflicted with stone or stricture, from the immoderate straining that they employ in passing their urine.

The viscera most liable to hernial protrusion are the small intestines, omentum, and arch of the colon. But every one of them has occasionally been found protruded, partially or entirely—especially in cases of congenital deficiency of the abdominal parietes.

THE SAC of a hernia is a portion of the *parietal* or *reflected* layer of peritonæum which the protruding viscera push before them in their escape, and which forms a pouch containing them. It very soon contracts adhesion to the surrounding cellular tissue, and is consequently incapable of being replaced. As the hernia increases in size, it also increases;—partly by growth; partly by distension, and slight laceration or unravelling; partly by fresh protrusion of peritonæum. Sometimes it diminishes in thickness whilst increasing in capacity—sometimes, on the contrary, becomes thick, indurated, and divisible into layers. Its *neck* (the narrow part which communicates with the abdomen) always becomes thickened, rigid, and more or less puckered, in consequence of the pressure of the muscular or ligamentous fibres which surround it. Sometimes the sac has two necks—either because (as in oblique inguinal hernia) it passes through two tendinous apertures—(the external and internal abdominal rings)—or because the original neck has been pushed down by a fresh protrusion. Some herniæ, however, are destitute of a sac—or at least of a complete one. This may happen, (1) if the protruded viscus is not naturally covered by peritonæum; as the cœcum. (2.) If the hernia occur in consequence of a penetrating wound. (3,) In some cases of congenital umbilical hernia. (4.) Hernia may be considered virtually without a sac, if the latter has been burst by a blow, or if it has become entirely adherent to its contents.

DIVISION.—Hernia is divided into several species (1st) according to its *situation*—as the inguinal, femoral, and so forth: (2ndly) according to the *condition of the protruded viscera*;—which may be (*a*) *reducible*, (or returnable into the abdomen;) (*b*) *irreducible*; (*c*) *strangulated*; *i. e.* subject to some constriction which not only prevents their return into the abdomen, but interferes with the passage of their contents, and with their circulation.

REDUCIBLE HERNIA.—*Symptoms.*—A soft compressible swelling appears at some part of the abdominal parietes. It increases in size when the patient stands up—if grasped, it is found to dilate

when he coughs or makes any exertion—and it diminishes or disappears when he lies down, or when properly directed pressure is made upon it. If the sac contains intestine, (*entero-cele*,) the tumor is smooth, rounded, and elastic;—*borborygmi* (or flatulent croakings) are occasionally heard in it,—and when pressed upon, the bowel returns into the abdomen with a sudden jerk and gurgling noise. If, however, it contains omentum, (*epiplo-cele*,) the tumor is flattened, inelastic, flabby, and unequal to the touch, and it returns without noise, and very slowly,—the pressure requiring to be continued till it has entirely disappeared. But very often one hernia contains both intestine and omentum, (entero-epiplocele.) *Treatment.*—The indications are, to replace the hernia, and to prevent its return. The latter object is to be accomplished by the use of a *truss*; an instrument consisting of a pad placed on the seat of protrusion — and a steel spring passing round the body, and causing the pad to press with a requisite degree of force. In order to take the measure for a truss, the patient should lie down, and the hernia should be replaced—then he should stand up and be told to cough—whilst the surgeon ascertains with his fingers the exact spot at which the protrusion commences. The distance from this spot round the hip to an inch on the other side of the spine gives the required admeasurement. If the hips are very flat, or peculiarly formed, the measure should be taken with a piece of wire, stiff enough to keep its shape, so that it can be taken to the instrument-maker's for a pattern. The pad should not be too large, nor the spring too weak, or the instrument will be loose and inefficient; —nor should the spring be too forcible, or the pad too small, otherwise it will cause pain. But the patient must expect to find it rather irksome for the first week. The truss should be constantly worn by day; and if the patient will submit to wear it at night also, so much the better. If he will not do this, he should at all events apply it in the morning before he rises from the recumbent posture. Thousands of trusses, with every possible complication and variety of spring and pad, are daily advertised by their inventors; but any one who has had much practical knowledge of the subject, will not fail to agree with Mr. Liston, that "the simple truss well constructed, made for and fitted to the particular individual, with or without a thigh-strap, is to be preferred."

Radical Cure.—If the patient is below the age of puberty, or not much above it, and if the hernia have not existed very long, it is probable that the truss, if constantly worn, may effect a permanent cure. The herniary aperture, no longer subject to distension, may become firmly closed, and the neck of the sack obliterated. This cure may perhaps occur in two or three years, but as a measure of precaution, the truss should be worn for two or three years more. As for the old-fashioned attempts to obtain a radical cure by cutting out the sac—or by including its neck in a wire or other ligature—or by making a large slough of the superjacent skin—or the

modern American plan of making forcible pressure on the neck of the sac by means of a truss with a strong spring and a wooden or ivory pad, so as to excite the adhesive inflammation there—or M. Belmas's scheme of poking little bladders of goldbeater's-skin upon sticks of gelatin into the neck of the sac for the same purpose—* the less that is said about them the better. One or two measures for the radical cure of inguinal hernia will be mentioned in their proper place.

II. IRREDUCIBLE HERNIA.—Hernia is said to be *irreducible* when the protruded viscera cannot be returned into the abdomen, although there is no impediment to their functions or to their circulation. *Causes.*—Hernia may be rendered irreducible, (1) by an adhesion of the sac to its contents, or of the latter to each other, or by membranous bands formed across the sac. (2.) By enlargement of the omentum or mesentery—whether from simple deposition of fat, or from sarcomatous or other organic change. (3.) Omental hernia may be rendered irreducible by a contraction of that portion which lies in the neck of the sac, so that it is not stiff enough to stand against the pressure intended to push it back into the abdomen, but doubles up under it.

Consequences.—The patient is liable to dragging pains in the abdomen, and vomiting after food, or when he assumes the erect posture—because the protruded omentum or intestines, being fixed, resist all distension or upward movement of the stomach. These inconveniences will be greatly aggravated, if the patient increase in corpulency or become pregnant. Moreover, the protruded bowels being deprived of their natural support, their fæculent contents are apt to lodge in them, and frequently cause colic and constipation. Lastly, the bowel is greatly exposed to external injury, and in constant hazard of strangulation. *Treatment.*—(1.) The *palliative* treatment consists in applying a hollow bag truss, or else a truss with a hollow pad that shall firmly embrace the hernia, and prohibit any additional protrusion. The patient should avoid all violent exertion or excess in diet, and should never let his bowels be confined. (2.) *Radical Cure.*—It has occasionally happened, after confinement to bed for several weeks with fever or some other emaciating ailment, that a hernia, irreducible before, has been replaced with ease, owing to an absorption of the fat of the omentum or mesentery, and relaxation of the abdominal apertures. The same result has also in some cases been effected by art—by keeping the patient in the recumbent posture and on very low diet for six weeks or two months, and by the frequent use of glysters and laxatives. This plan is very uncertain as to its results, and will be effectually defeated if there are any adhesions; and there are not many patients who will submit to it. It will be more likely to succeed if the hernia is omental. Any surgical operation with the view of open-

* Vide Lancet, 1829-30, vol. ii. p. 390.

ing the sac, dividing adhesions, and returning the parts into the abdomen, is scarcely justifiable, as it would be exposing life to too great a hazard for the removal of a mere inconvenience.

III. STRANGULATED HERNIA.—The *causes* of strangulation may be (1) A sudden protrusion of bowel or omentum through a narrow aperture, in consequence of violent bodily exertion,—(a thing not unlikely to happen if a truss has been worn for some time, and then is carelessly left off.) (2) Swelling of the neck of the sac, or spasm of the muscular fibres around it. (3) Distension of the protruded intestines by flatus or fæces,—or congestion of the omentum or mesentery. The *seat of stricture* is generally at the neck of the sac, but in some rare cases the bowel has been constricted by membranous bands, or by apertures in the omentum, or in the sac itself. The *symptoms* of strangulated hernia are, *first*, those of obstruction of the bowels;—*secondly*, those of inflammation. The patient first complains of flatulence, colicky pains, a sense of tightness across the belly, desire to go to stool, and inability to evacuate. (It is true that stools may be passed if there be any fæcal matter in the bowel below the hernia, or if the hernia be entirely omental, but with very transient relief.) To these symptoms succeed vomiting of the contents of the stomach,—then of mucus and bile,—and lastly, of matters which have acquired a *stercoraceous* smell by being delayed in the small intestines. Meanwhile the tumor is uneasy, tense, and incompressible. If this state of things continue, the inflammatory stage comes on. The neck of the sac becomes tender, and tenderness diffuses itself over the tumor and over the abdomen, both of which become very painful and much more swelled. The countenance is anxious;—the vomiting constant;—the patient restless and despondent;—and the pulse small, hard, and wiry. After a variable time the constricted parts begin to mortify. The skin becomes cold,—the pulse very rapid and tremulous,—and the tumor dusky red and emphysematous, but the pain ceases, and the patient, having perhaps expressed himself altogether relieved, soon afterwards dies. *Varieties.*—There is often considerable diversity in the rapidity and violence of these symptoms. If the patient be a strong adult, and the strangulation has commenced suddenly with a fresh protrusion during strong exertion, the inflammatory stage may come on instantly, and be followed by death in a very few hours. On the other hand, if the patient is old,—if the hernia has been long irreducible, and has a large neck,—and if the strangulation is produced by distension of the protruded bowel with flatus or fæces—the symptoms of mere obstruction may last many days before those of inflammation come on. To this latter class of cases the term *incarcerated* is applicable. Again, if the hernia be omental, the symptoms will be less acute than if it be intestinal. *Diagnosis.*—If a patient with irreducible hernia be attacked by colic, or enteritis, or peritonitis, the case will present many of the features of strangulation. Yet it

may perhaps be distinguished by noticing that the pain and tenderness did not begin at the neck of the sac, and are not more intense there than elsewhere. The diagnosis will be very obscure if the omentum or intestine in the sac are primarily inflamed. But the general rule is, *when in doubt, operate.* In every case of sudden and violent vomiting and colic, the seats of hernia should be well examined; because the patient may have been labouring under it for years, and yet from ignorance or *mauvaise honte* may not mention it. *Morbid Appearances.*—After death from strangulated hernia, the bowels are found reddened,—the upper portion of them much distended,—and there are effusions of turbid serum and lymph. Around the sac, the tissues are œdematous or emphysematous. The strangulated intestine is dark, claret-coloured, and turgid with blood,—deprived in parts of its polish by a coating of lymph,—and displaying patches of gangrene, *i. e.* greenish or ash-coloured spots, which break down under the finger. The omentum is dark red—if gangrenous, it feels crispy and emphysematous, and the blood in its veins is coagulated. The sac also contains bloody turbid serum. *Treatment.*—The indications are, 1st, to return the intestine or any portion of it that may not be irreducible; 2ndly, to divide any constricting part, if necessary; 3rdly, to obviate inflammation.

In the first place, an attempt should be made to return the protrusion by manual operation—technically called *taxis.** The bladder being emptied, the patient should lie down, with his shoulders raised, and both thighs bent up towards the belly and close to each other, so that every muscle and ligament connected with the abdomen may be relaxed. He should be engaged in conversation to prevent him from straining with his respiratory muscles. Then the surgeon, if the tumor be large, grasps it with the palms of both hands,—gently compresses it in order if possible to squeeze a little of the flatus into the abdomen,—pushes it *in the axis of the neck of the sac*, and at the same time with his fingers gently kneads and *sways* the parts at the neck of the tumor, so as if possible to dislodge them. This operation may be continued for a quarter or half an hour—longer if the tumor is indolent, but not so long if it is tender,—and at last, perhaps, the surgeon will be delighted to hear a gurgling sound accompanying the return of a portion of intestine. The operator should recollect that too much force may bruise or rupture the viscera, or drive sac and all into the abdomen,—and that he must not be satisfied with a partial reduction of the volume and tension of the tumor, if the vomiting remains unrelieved,—because such diminution might be caused by merely forcing the serum contained in the sac into the abdominal cavity.

If the taxis do not succeed, certain auxiliary measures may be

* From τασσω, I set in order.

resorted to, in order to relax the muscles, reduce the heart's action, and diminish the size of the tumor. *Bleeding* to the approach of faintness, and the *hot bath*, are the most important. They should be used *before the taxis*, if the belly is tender, and the patient is not too weak to bear them,—and if the taxis have been once tried unsuccessfully, it may be repeated whilst the patient lies relaxed in the bath. The *tobacco enema* (℥j ad Oj aq. ferv. allowed to stand ten minutes, and half to be used at a time) has certainly been successful in many cases, especially of inguinal hernia,—but it requires great caution. It has proved immediately fatal to some patients, and has rendered others incapable of surviving the shock of the operation. *Cold* applied to the tumor by means of pounded ice or a freezing mixture (F. 12) in a bladder, reduces inflammation, condenses flatus, and constringes the skin. It is most applicable to large scrotal herniæ. It too is not without its hazards, for it may cause gangrene of the skin if applied too long, or if hot applications are incautiously used after it. *Opium* is sometimes of service after bleeding, especially if vomiting is violent. *Tartar emetic*, given as in dislocation, is said to have been employed with benefit, but it is a most hazardous remedy. *Purgatives and enemata* are irritating and mischievous in sudden acute strangulation, but vastly beneficial if the patient is aged, the hernia large and long irreducible, and if the attack has been preceded and caused by constipation. Large doses of calomel and colocynth are the best purgatives, and the enemata should consist of as much salt and water as can be injected without causing very much pain or distension. They should be injected with a pumping syringe, and not with those filthy, inefficient, and now happily obsolete instruments, the bladder, and pipe, or old-fashioned pewter syringe. But, finally, if the taxis, bleeding, and warm-bath do not succeed, it is the safest plan, on the average, to perform an operation for dividing the stricture without delay,—using the other remedies if the patient will not consent—except of course in the class of cases in which purgatives are likely to give relief.

The *operation* generally performed consists in opening the sac, dividing the stricture, and returning the intestine. Some surgeons, however, recommend the sac not to be opened,—but to release the stricture by dividing the parts surrounding its neck, and then return the intestine by the taxis,—thus avoiding the dangers of opening the peritoneal cavity. This practice *may* be adopted if the hernia be small and quite recent,—but as a general rule it is unsafe, (1) because the seat of stricture may be in the sac itself, particularly at its thickened neck,—and (2) because it is always desirable to examine the state of the intestine before returning it. When the sac is opened, the intestine should be well examined, and especially that part of it which has been actually compressed by the stricture, and which should be gently drawn down for that purpose. If it be merely dark claret-coloured from congestion,—or slightly rough-

ened with lymph,—or if it exhibit a few black patches of ecchymosis, it should be returned—the operator being careful to replace it bit by bit—intestine before omentum—and those parts first which protruded last. The wound may then be closed with one or two sutures, and a firm compress be placed upon it. If the hernia were irreducible long before it was strangulated, and if its contents are united to the sac by firm broad adhesions, they should not be disturbed. But if adhesions are recent, or very thin and slight, they may be divided and the bowel be returned. If the intestine is mortified, which will be known by the softened green or ashy spots, the mortified part should be slit open, the stricture be divided, and the patient left to recover with an artificial anus. Again, if a large portion of intestine, which has been long irreducible in an elderly person, appear extremely dark and advanced towards sphacelus, so as to render it doubtful whether it would be capable of performing its functions when returned,—the safest plan is to make an opening into it, and so afford an outlet for its contents, although the inconvenience of an artificial anus must of course be considered. If the omentum is gangrenous, or if it is thickened and indurated, it would, if returned, excite dangerous irritation of the peritoneum. In this case some surgeons advise it to be left to granulate in the sac,—or to cut it off close to the neck of the sac, and leave it there as a plug to prevent further protrusion. Macfarlane and others, on the contrary, recommend it to be cut cleanly off, and all the vessels to be tied with fine silk ligatures, and the end to be then passed quite into the abdomen—breaking up any adhesions about the neck of the sac, if necessary; —thus avoiding the dragging pains and colic which are liable to occur if a portion of the omentum or intestine be fixed.

After Treatment.—After the herniai s returned, whether by taxis or operation, the patient should be put to bed—all exertion being strictly forbidden. Vomiting must be treated by large doses of calomel and opium, and by effervescing draughts containing one or two drops of prussic acid,—tenderness and pain by bleeding, leeching, calomel, and fomentations. If the bowels do not act in three or four hours, they may be solicited by injections, but salts and other acrid purgatives administered by the mouth can scarcely fail to be mischievous; for as the intestine that was constricted remains for some time inflamed, weakened, and incapable of propelling its contents, they would but irritate it uselessly. Castor oil, or rhubarb and magnesia, may be resorted to after twelve hours. A truss should be applied before the patient gets up again.

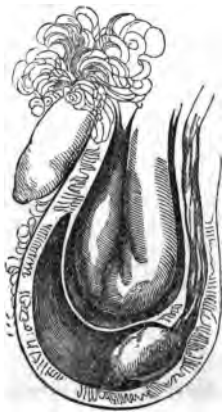
SECTION II.—OF INGUINAL HERNIA.

DEFINITION.—Inguinal hernia is that which protrudes through one or both abdominal rings.

VARIETIES.—There are four varieties. The oblique,—direct,—congenital,—and encysted.

(1) The *oblique* inguinal hernia is the most common. It takes precisely the same route as the testicle in its passage from the abdomen into the scrotum. It commences as a fulness or swelling at the situation of the internal abdominal ring, (*i. e.* a little above the centre of Poupart's ligament,)—next passes into the inguinal canal, (and in this stage is called *bubonocele*,)—and if the protrusion increase, it projects through the external ring and descends into the scrotum of the male, or labium of the female. The *coverings* of this hernia are, 1, skin; 2, a strong layer of condensed cellular tissue, derived from the *superficial fascia* of the abdomen, in which the *external epigastric artery* ramifies. With this is mostly incorporated, 3, the *fascia spermatica*—a tendinous layer derived from the margin of the external ring. Under this lies, 4, the *cremaster muscle*—sometimes called *tunica communis*. 5, Next comes the *fascia propria*, a cellular layer continuous with the *fascia transversalis* of the abdomen; and lastly, 6, the sac. The *internal epigastric artery* is always internal to the neck of the sac. The *spermatic cord* is generally behind the sac; but in some old cases, the tumor has passed backwards between the vas deferens and spermatic artery, so as to place them in front of it.

2. The *direct* inguinal hernia bursts through the *conjoined tendon* of the internal oblique and transversalis muscles, just behind the external ring. Its coverings are the same as those of the oblique, except the cremaster, for it has no connexion with the cord. The epigastric artery runs external to its neck.



3. The *congenital* hernia is a sub-variety of the oblique, and is so called because that state of parts which permits of it only exists at or soon after birth. A portion of omentum or intestine accompanies the testicle in its descent, and passes down into the very pouch of peritoneum forming the *tunica vaginalis reflexa*, before its communication with the general peritoneal cavity has become obliterated. The sac of this hernia is consequently formed by the tunica vaginalis,—its coverings in other respects are the same as of the oblique.

4. The *encysted* (or *hernia infantilis*) is a sub-variety of the congenital. The protruding bowel pushes before it a sac of peritoneum either into, or close behind, the tunica vaginalis, and this tunic and the sac adhere very

closely together. This hernia, therefore, (as may be seen in Mr. Liston's diagram, p. 340,) has, as it were, two sacs,—viz. one proper sac, and another anterior, composed of the tunica vaginalis, which in these cases is very liable to be the seat of hydrocele.

DIAGNOSIS,—(1.) The difference between the *oblique and direct inguinal hernia*, and their relations to the epigastric artery, are shown in the accompanying figure. In the oblique, the neck of

the tumor inclines upwards and outwards, and causes a fulness extending up to the middle of Poupart's ligament. In the direct, it inclines, (if at all) rather inwards; and when the hernia is reduced, the finger, carrying integument before it, can be passed straight back into the abdominal cavity. But in old cases of oblique hernia, the neck of the sac is dragged down towards the mesial line, so that all distinction is lost.

(2.) *Hydrocele* may be distinguished from hernia by its beginning below, being semi-transparent, fluctuating, preventing the testicle from being clearly felt, (whilst the cord can be distinctly felt above it,) and by not dilating on coughing; hernia being the reverse in all these particulars. But hernia may and does often co-exist with hydrocele, the former beginning from above, the latter from below.

(3.) *Hydrocele of the cord*, if low down, may be distinguished by its transparency and fluctuation; but high up, it may extend into the abdominal ring, and receive an impulse on coughing, and the diagnosis be very difficult. But as a hernia may be concealed

behind it, the rule, *when in doubt, operate*, should be acted upon in case of symptoms of strangulation.

(4.) *Varicocele*, (or *cirsocele*,) a varicose enlargement of the spermatic veins, increases in the erect posture, and perhaps dilates on coughing; but it may be distinguished from hernia by its feeling like a bag of worms; and although, like hernia, it disappears when the patient lies down, and the scrotum is raised, still it quickly appears again, if pressure be made upon the external ring,—though that pressure would effectually prevent a hernia from coming down again. Lastly, it needs scarcely be said that an imperfectly descended testicle must not be mistaken for bubonocele.

Treatment.—(1.) The *reducible* must be kept up with a truss, of which the pad generally requires to press on the internal abdominal ring, and the spring should pass round midway between the trochanter and ilium. Care must be taken not to let the pad slip down, and bear against the spinous process of the pubes. Two plans have been proposed for the radical cure of this hernia. One (which is useless) consists of transfixing the root of the scrotum with a number of pins, and making pressure at the same time with corks, through which the pins are passed, so as to create the adhesive inflammation in the sac. A second, which is more feasible, consists in pushing a fold of integument as far up as possible into the neck of the sac, securing it in this inverted or invaginated position by means of two sutures, (both ends of a ligature being passed from within the invaginated skin,) and then denuding the pouch of invaginated skin of its cuticle by means of liquor ammoniæ, so that the surfaces of skin and peritoneum thus opposed to each other may adhere, and the neck of the sac be effectually plugged.

(2.) The *irreducible* must be supported with a bag truss. If it only contain *omentum*, a common truss may perhaps be applied in the usual manner, so as to make it adhere to and plug the neck of the sac. But this cannot often be borne, and is liable to induce swelled testicle.

(3.) In performing the taxis for the relief of strangulated oblique inguinal hernia, the patient should be placed in the position described in a foregoing page (337), with his thighs as close together as possible, (although the surgeon must put one arm between them,) and the pressure must be made upwards and outwards.

The *operation* for this hernia is performed thus—The parts being shaved, and the skin made tense, an incision three or four inches long must be made through the skin, along the axis of the tumor, beginning from above its neck. This will be quite long enough even for the largest herniæ: because the object is to bring the seat of stricture fully into view, without exposing too much of the sac. Then the successive coverings before enumerated are to be divided in the following manner—a little bit of each is to be pinched up with forceps, and to be cut into with the knife held horizontally; a

director is to be passed into this little aperture, and the layer is then to be divided on it to the extent of the incision in the skin. Cautious operators will find (or make) many more layers than those usually enumerated—which are, in fact, subdivisible, especially in old herniæ. When at last the sac is reached, which will be known by its bluish transparency—it is to be opened to the like extent—a little bit of it being first pinched up and scratched through so as to admit the director. If possible, it should be done at a part where there is some serum, or omentum, between it and the bowel. Then the left forefinger should be passed up into the neck of the sac to seek for the stricture, which will generally be at the internal ring. It may be at the external ring, (or at both,) but wherever it may be, it must be dilated so as to allow the finger to pass into the abdomen. A curved blunt-pointed bistoury—not cutting quite up to the point—should be passed up flat on the finger through the stricture, and its edge be then turned up so as to divide it; and in every case the division should be made DIRECTLY UPWARDS—parallel to the linea alba; and then, whether the hernia be direct or oblique, the epigastric artery will not be wounded. If no stricture be discovered in the neck, it must be sought for in the body of the sac.

The subsequent proceedings—the return or otherwise of the intestine, and the after treatment—are detailed in the preceding section.

SECTION III.—OF FEMORAL OR CRURAL HERNIA.

Definition.—Femoral hernia is that which escapes behind Poupart's ligament.

It passes first through the *crural ring*—an aperture bounded internally by *Gimbernat's ligament*—externally by the femoral vein—before, by Poupart's ligament—and behind by the bone. It next descends behind the *falciform process* of the fascia lata—thirdly, it comes forwards through the *saphenic opening* of that fascia—and, lastly, as its size increases, it does not descend down on the thigh, but turns up over the falciform process, and lies on the anterior surface of Poupart's ligament. The *coverings* of this hernia are—1. Skin. 2. The *superficial fascia* of the thigh—loaded with fat and divisible into an uncertain number of layers. 3. *Fascia propria*, a layer of cellular tissue derived from the sheath of the femoral vessels—or, according to others, from the *fascia cribriformis* which closes the saphenic aperture. It is in general pretty dense about the neck of the hernia, but thin, or even deficient on its fundus. 4. The sac. Between the two last there is often found a considerable layer of fat, which might be mistaken for omentum. This hernia rarely attains a very large size. It is much more frequent in the female than the male—obviously from the greater breadth of the pelvis.

DIAGNOSIS.—(1.) Femoral hernia may be distinguished *from inguinal* by observing that Poupart's ligament can be traced over the neck of the sac, and that the spinous process of the pubes lies internal to it; whereas it is the reverse in the inguinal hernia. Besides, the femoral is generally much smaller, and is more frequent in women.

(2.) *Psoas abscess* resembles this hernia in its situation—in dilating on coughing, and diminishing when the patient lies down. The points of distinction are, that it is generally more external, that it fluctuates, but does not feel tympanitic, and that it is attended with pain and weakness of the back.

3. *Varix of the femoral vein* also dilates somewhat on coughing, and diminishes when the patient lies down; but then, if pressure be made below Poupart's ligament, the swelling quickly reappears, although it must be evident that under such circumstances a hernia could not come down.

4. *Bubo and other tumors of the groin* may in most cases be recognised by their general character and history, and by their being unattended with abdominal disorder. But if there be any such swelling, and symptoms of strangulation as well, an incision should certainly be made to examine it. The very best surgeons have been known to fail in their diagnosis of these cases.

TREATMENT.—(1.) The reducible femoral hernia should be supported by a truss; the pad of which requires to be bent downwards at an angle with the spring. Its pressure should tell against the hollow which is just inferior and external to the spinous process of the pubes. This hernia is very seldom, if ever, cured radically.

(2.) The irreducible should be supported by a truss with a hollow pad, or perhaps (if it be omental) the pressure of a common pad may be borne.

(3.) The femoral hernia, when strangulated, gives rise to much severer symptoms than the inguinal does, because of the denser and more unyielding nature of the parts which surround the neck of the sac. In performing the taxis, the patient should be placed in the usual position, with the thigh of the affected side much rolled inwards, and crossed over towards the other side. The tumor should first be drawn downwards, from the anterior surface of Poupart's ligament, and then be pressed with the points of the fingers backwards and upwards. If, however, the taxis (with bleeding and the warm-bath if the tumor is tender) does not soon succeed, the operation should be resorted to. No good will be done by any other measures.

Operation.—In the first place, the skin must be divided. Some surgeons make one simple perpendicular incision. Sir A. Cooper directs one like an inverted ⅃; and Mr. Liston prefers making one along Poupart's ligament, and another falling perpendicularly from

its centre over the tumor, thus, (for the right side.) The skin may be very safely and expeditiously divided by pinching it up into a fold, and running the knife through it with its back towards the sac. Then the different cellular layers down to the sac must be divided by bistoury and director, as in the inguinal hernia, and the sac must be opened with very great care, because it is generally very small, embracing the bowel tightly, and seldom contains any serum or omentum. Then the finger should be passed up to seek for the stricture, which, according to Sir A. Cooper, Mr. Liston, and the other best authorities, will be found to be the *inner edge of the falciform process.* This must be gently divided for a line or two, the incision being directed UPWARDS AND A LITTLE INWARDS, towards the spinous process of the pubes. It must be recollected, that if this incision were carried too far, the spermatic cord in the male, or round ligament in the female, would be injured. The division of Gimbernat's ligament (which is recommended by some) is considered by the above-named authorities to be much less efficacious, and is rather hazardous, inasmuch as the obturatrix artery not unfrequently runs round behind it, and would be infallibly divided.

SECTION IV.—OF THE UMBILICAL, VENTRAL, AND OTHER REMAINING SPECIES OF HERNIA.

I. UMBILICAL HERNIA—(*exomphalos*)—is, for obvious reasons, most frequent in children soon after birth. It is also not uncommon in women who have been frequently pregnant, although, in many of the so called umbilical herniæ in adults, the hernial aperture is not at the umbilicus, but a little on one side of it. The coverings of this hernia are skin, superficial fascia, and sac; they are always very thin, and not unfrequently the sac is adherent to its contents. *Treatment.*—If *reducible*, and the patient an infant, the best plan is to place a hemisphere of ivory with its convex surface on the aperture, and retain it there with cross strips of plaster, and a bandage round the belly. A pad of linen, covered with sheet lead, will do as well. But the belly should by no means be bound up too tightly, otherwise there will be danger of producing inguinal hernia. An adult should wear a truss, or broad belt, with some contrivance to prevent it from slipping down below its proper level. For the irreducible, a large hollow pad should be worn. The reduction of this hernia is effected by the ordinary manual taxis; but if it be very large, Sir A. Cooper recommends it to be compressed by a wooden platter. If it become strangulated, and the patient is aged, and the strangulation was preceded by constipation, purgatives and copious enemata should have a fair trial. If the operation is necessary, an incision three inches in length should be made at the upper part of the tumor through the skin,

fascia, and sac, in succession. The stricture should then be dilated directly upwards in the linea alba with the knife recommended in other cases. But perhaps it is better to make the incision so as to divide the under side of the neck of the sac, as advised by Mr. Liston.

II. VENTRAL HERNIA is that which protrudes through the *lineæ semilunares* or *transversæ*, or in fact through any other parts of the abdominal parietes, save those which are the ordinary seats of hernia. Its treatment requires no distinct observations; but if it should ever be necessary to operate for the relief of strangulation, the epigastric artery should be avoided.

III. PERINÆAL HERNIA descends between the bladder and rectum, forcing its way through the pelvic fascia and levator ani, and forming a tumor in the perinæum.

IV. VAGINAL HERNIA is a variety of the preceding;—in which the tumor projects into and blocks up the vagina, instead of descending to the perinæum.

V. LABIAL or PUDENDAL HERNIA descends between the vagina and ramus of the ischium, and forms a tumor in one of the labia. It is to be distinguished from inguinal hernia by the absence of swelling at the abdominal rings. These three herniæ must be replaced by pressure with the fingers, and kept up by pads made to bear against the perinæum, and by hollow caoutchouc pessaries worn in the vagina.

VI. OBTURATOR or THYROID HERNIA projects through the aperture in the obturator ligament which gives exit to the artery and nerve.

VII. ISCHIATIC HERNIA protrudes through the sciatic notch. This and the preceding are exceedingly rare;—and the tumors are of necessity small. If discovered to exist during life, they must be returned and supported by proper apparatus—and if strangulated, the stricture must be divided.

VIII. DIAPHRAGMATIC HERNIA may be a result of congenital deficiency or accidental separation of the fibres of the diaphragm. This form of hernia, if strangulated, will produce the ordinary symptoms—vomiting, constipation, and pain;—which are not in any manner to be distinguished from the symptoms of ileus or intus-susception—or from those produced when a fold of bowel is entangled in a rent in the omentum, or mesentery; or constricted by membranous bands resulting from previous inflammation of the peritoneum.

CHAPTER XIX.

OF THE SURGICAL DISEASES AND INJURIES OF THE RECTUM AND ANUS.

I. FOREIGN BODIES in the rectum sometimes require to be removed by surgical art. They may either consist of small bones or the like that have descended from above, or of pins, glyster-pipes, or other bodies introduced from below. Substances of very extraordinary dimensions (a blacking-bottle, for instance,) have been forced into the anus. The grand point is first to dilate the bowel well, by passing in several fingers (oiled) or by means of a speculum;—and then a proper forceps, or a lithotomy scoop, may generally be used with success.

II. IMPERFORATE ANUS, (*atresia ani*,) congenital closure of the rectum, may occur in various degrees. The gut may terminate in a blind pouch at any point from the sigmoid flexure downwards, and the anal aperture be altogether wanting—or the anus may be open for an inch or two, with an obstruction beyond. *Treatment.*—If the end of the intestine can be felt protruding when the child cries, a crucial incision may be made into it without delay—if it cannot be felt, a day or two should be waited, so that it may become distended with meconium, and then a cautious incision should be made with a double-edged bistoury, in the direction of the curve of the sacrum. If it succeed in reaching the bowel, the aperture should be kept open by tents.

III. SPASM OF THE SPHINCTER ANI—violent pain and hardness of the muscle, with difficulty of evacuating and of introducing the finger—may be caused by constipation of the bowels, or disorder of the health. It may occur in sudden paroxysms which soon go off, — or may last permanently and lead to organic thickening and stricture of the anus. *Treatment.*—In recent cases, a dose of calomel and Dover's powder, followed by castor oil, and by enemata of warm water with a little laudanum, will relieve the paroxysm. In more obstinate cases, a bougie or mould candle should be passed daily—alteratives and enemata of warm water should also be administered daily; but if they fail, the sphincter must be divided and made to heal by granulation. *Division of the Sphincter* is easily performed by introducing the forefinger into the anus, and a straight, narrow, blunt-pointed bistoury by its side—and then making an incision of sufficient extent towards the tuberosity of the ischium.

IV. HÆMORRHOIDS, or PILES, are small tumors situated near the anus, consisting *anatomically* of hypertrophied cellular tissue, con-

taining a number of dilated varicose veins. The *predisposing causes* are any circumstances that produce fulness of the abdominal vessels, or that impede the return of blood from the rectum—such as luxurious and sedentary habits of life—pregnancy, constipation, disease of the liver or lungs retarding the passage of blood through them, and tight stays. The *exciting causes* may be anything that irritates the lower bowels,—particularly large doses of aloes—ascarides—horse exercise, or the application of cold and damp to the posteriors. Piles are most frequent in women, and are rare under puberty. They are divided into *internal* and *external*, according as they are situated within the rectum or around the anus. They may be met with in two states—*indolent* or *inflamed*. When indolent, they merely produce the inconveniences that necessarily result from their bulk and situation—when inflamed, they occasion the following *symptoms*. Pain, heat, itching, fulness and tension about the anus—pain and straining in passing evacuations—with perhaps more or less bleeding. These symptoms may, in violent cases, be complicated with irritation of the bladder, frequency of micturition, pain in the back, pain and aching down the thighs—which perhaps the patient may describe as his principal or only complaint.

Internal Piles are generally firm tumors, varying in size from that of a pea to that of a walnut, of a pale or reddish-brown colour when indolent, but dark or bright red when congested or inflamed. They are exceedingly liable to hæmorrhage, and generally cause great inconvenience by protruding at each motion.

External Piles may be met with (1) in the form of round hard tumors just at the margin of the anus, and covered half with skin and half with mucous membrane; or (2) of oblong ridges of skin external to the sphincter. These are commonly called *mariscæ*, or blind piles, because they do not bleed.

General Treatment.—The grand objects are to remove the predisposing and exciting causes. The patient ought to live abstemiously, and take plenty of exercise. The bowels should be regulated by some mild aperient, capable of producing copious soft evacuations without straining or griping. Senna, sulphur, castor oil, cream of tartar, and magnesia, in the form of electuaries (F. 42) are the best, and blue pill, or hydr. c. creta should be added if the liver is inactive. In chronic cases, the confect. piperis comp. may be given with great benefit in doses of ʒj ter die. The bowels should act once daily—and Dr. Burne says, that the evening is a much better time for that purpose than the morning. The seat of the water-closet should shelve inwards at its margin. If the piles are inflamed, leeches to the anus, or cupping on the sacrum, a dose of castor-oil, salines, opiates, and hot fomentations or poultices, are the requisite measures. Cold lotions of lead (with a little tinct. opii) may be substituted for the warm applications, if more comfortable.

Local Treatment.—(1.) The first and most essential measure is *perfect cleanliness.* Mr. Mayo directs the anus to be well washed with *yellow soap* and water after each motion—and if the piles are internal, and protrude during evacuations, they should be washed before they are returned. (2.) *Astringents*—the zinc lotion (F. 15)—or unguentum gallæ, to which latter a little of the liq. plumbi diac. may be advantageously added, (F. 43,) are generally of benefit. Dr. Burne recommends an ointment composed of pulv. hellebori nigri ʒj adipis ℥j, which he says never fails of affording great relief, although exceedingly painful for a time. (3.) *Pressure* by means of a bougie introduced occasionally—or of a pad of ivory with or without a spring, made to bear against the anus by a T bandage, are often of service. A short egg-shaped ivory bougie introduced into the anus, and attached by a slender neck to an ivory pad—so that pressure is thus made both internally and externally—is extremely useful in cases of internal piles with prolapse. (4.) *Extirpation* is the last resource, if the preceding constitutional and local measures fail. But it must not be performed if the constitution is bad, and labouring under serious organic disease; and it must be both preceded and followed by a course of most abstemious diet, and medicines to maintain the secretions. External piles may be removed by *excision;* the internal by ligature. *Excision* of the latter might occasion dangerous hæmorrhage. The bowels having been previously well cleared, the patient must be told to protrude the piles; and if he cannot do it easily, he should sit over a vessel of warm water, or have an enema of warm water. Then the piles should be drawn out with a tenaculum, and a ligature (not too fine) be applied as tightly as possible round the base of each. If one of the tumors is large, a double ligature may be passed through its base with a needle, and either half be tied separately. Before finally tightening the ligatures, the piles should be slightly punctured. After the operation, the ends of the thread should be cut short, and be returned into the rectum. Pain is to be relieved by an opiate, or by leeches; and if it persist, the piles should be examined to see whether the ligatures remain as tight as possible, and if not, they should be reapplied.

V. Warts, Condylomata, and other excrescences around the anus, that arise from local irritation, are to be removed with the knife.

VI. Hæmorrhage from the rectum—an exhalation of blood from the mucous membrane in consequence of congestion or of determination of blood—is a very frequent concomitant of piles—from the surface of which, in fact, the discharge may proceed. The blood is generally of a florid hue, is exuded during the passage of an evacuation, and covers the fæces, but is not intimately mixed with them. *Treatment.*—(1.) If the hæmorrhage is moderate in quantity—if it has been of habitual or periodic occurrence—if it induces no weakness—and if it brings relief to pain in the

the head, or any other feeling of disorder—the only justifiable means of suppressing it are exercise, temperance, and alterative and aperient medicines, with the view of removing the state of plethora that occasions it. (2.) But if the patient is weak, pale, or emaciated, the bleeding must be suppressed. Cold astringent injections—(dec. cinchon. vel quercus, vel infus. catechu)—the ligature of any hæmorrhoidal excrescences—and the salts of iron, combined with bark or the mineral acids—or still better, the balsams of Peru or copaiba, or oil of turpentine, (mxv—xxx,) in repeated doses, are the remedies.

VII. DISCHARGE OF MUCUS—clear and viscid—without fæcal odour, may be caused by piles, ascarides, the use of aloes, or any other causes of irritation to the rectum. To be treated by astringent injections, together with copaiba and the other remedies for the suppression of hæmorrhage.

VIII. ABSCESS near the rectum may be caused by the irritation of foreign bodies, or by caries of an adjacent bone, but much more frequently by the various causes of disordered circulation in hæmorrhoidal vessels that were mentioned as producing piles. They may either be large and deep-seated, or small and superficial. (1.) Deep-seated abscesses are attended with great aching and throbbing,—difficulty and pain in evacuating the fæces,—and fever, —and on internal examination a fulness or fluctuation may be felt. If these abscesses are left to themselves, a vast quantity of matter may accumulate in the loose cellular tissue of the pelvis, and severe irritative fever result from its confinement. (2.) Superficial abscesses are attended with more or less pain, tenderness, and throbbing, and swelling around the anus. They are often chronic, and often occur in the consumptive. *Treatment.*—Leeches and fomentations may be tried at first—but if they do not very soon remove the pain and tenderness, or if there is the least suspicion that matter is forming, a bistoury should be pushed home into the inflamed part,—and if it be at all extensive, two or three punctures should be made.

IX. FISTULA IN ANO is a very common consequence of abscess, a fistulous track being left by the side of the sphincter. It is extremely difficult to heal, because the constant contractions of the sphincter and levator ani interfere with the union of its sides. There are three kinds. (1.) The *complete fistula* which has one external opening near the anus, and another into the bowel above the sphincter. (2.) The *blind external fistula*, which has no opening into the bowel, although it mostly reaches its outer coat. (3.) The *blind internal fistula*, which opens into the bowel, but not externally, although its situation is indicated by a redness and hardness near the anus. *Treatment.*—The grand remedy for this affection is division of the sphincter ani, so as to prevent contraction of that muscle for a time, and cause the fistula to heal from the bottom. The digestive organs and secretions must first be put in good order,

and the bowels be well cleared by castor-oil and an injection, so that they may not want to be disturbed for two or three days. *Operation.*—The patient being placed on his knees and elbows on a bed, or being made to kneel on a chair and lean over the back of it, and the nates being kept asunder by an assistant, the surgeon introduces his left forefinger into the anus, and at the same time explores with a probe the whole extent and ramifications of the fistula. If it is of the *blind internal* kind, its situation must be ascertained, and a puncture be made into it by the side of the anus. Perhaps a probe bent at an acute angle may be passed into it from the bowel, and serve as a guide for the puncture. Then, one forefinger being still in the anus, the surgeon passes a strong curved probe-pointed bistoury up to the further end of the fistula. Next (if there is no internal opening) he pushes it through the coats of the bowel, so that its point may come in contact with his forefinger. Then he puts the end of his forefinger on the point of the bistoury, and draws it down out of the anus; and as soon as it is fairly emerged, he pushes the handle towards the orifice of the fistula, so as to divide skin, sphincter, and bowel at one sweep. If there are more fistulæ than one, or any branches, they must also be laid open. A few threads of oiled lint are then to be placed in the wound, and the patient to be kept in bed for three days. The subsequent treatment consists in the use of perfect cleanliness, and the daily introduction of a very little slip of lint (which may be dipped in some stimulating lotion if necessary) between the edges of the wound, so as to prevent its premature union, and cause it to granulate from the bottom. If hæmorrhage prove violent after this operation, and does not yield to the application of cold, the anus must be well dilated with a speculum, so as to expose the bleeding surface to the air,—and any artery discernible may be tied.

If the patient will not submit to this operation, or if he is labouring under disease of the lungs or liver in an advanced stage, so that it would be unsafe,—the confect. piperis, or copaiba and tonics, may be administered internally, and stimulating injections and ointments be applied to the fistula; but they will rarely be of any avail.

X. Rhagades—fissures and excoriations about the anus—produce the utmost pain during the passage of evacuations, and if neglected may lead to spasm and permanent stricture of the sphincter. *Treatment.*—Aperients and alteratives,—regular diet,—astringent applications, such as zinc lotion, or borax and honey,—or mercurial ointment, or ung. hydr. nitrat. dilut., to which a little ext. belladon. should be added if there be much pain or spasm of the sphincter, and the strictest cleanliness. But if a fair trial of these measures is unavailing, the sphincter must be divided.

XI. Prolapsus Ani consists in an eversion of the lower portion of the rectum, and its protrusion through the anus,—the channel of the intestine may be seen opening in the centre of the protrusion.

This affection is most common in infancy and old age. It may depend on a natural laxity and delicacy of structure, or be caused by violent straining, in consequence of costiveness, or of the existence of stone or stricture. *Treatment.*—Whenever the protrusion occurs, the parts should be carefully washed, and then be replaced by pressure with the hand. If, however, as sometimes happens, a larger portion than usual has come down, and it is so swelled and tender from the constriction of the sphincter, and from being irritated by the clothes, that it cannot be returned, leeches, fomentations, a dose of calomel and opium, and rest in the horizontal posture for some hours, will remove the difficulty. To cure this affection, the bowels must be regulated by gentle aperients, (F. 42,) so as to prevent costiveness and straining,—the stools should be passed in the horizontal posture,—astringent injections, the occasional passage of a bougie, and support by pads and T bandages, may be used to give tone and firmness to the parts—and piles or any other source of irritation must be removed by appropriate remedies. But if the diligent employment of these measures is of no avail, certain operations may be resorted to. (1.) The mildest consists in pinching up two or three folds of mucous membrane on the protruded bowel with forceps, and tying them tightly with ligatures. (2.) Or ligatures may be passed by needles through several folds of skin just at the margin of the anus, which are then to be tied up tightly. Either of these operations may be repeated as often as necessary. Their effect in producing adhesion and consolidation of the relaxed tissues must be obvious.

XII. Internal Prolapsus.—Sometimes the upper part of the rectum becomes prolapsed and invaginated within the lower, giving rise to most of the symptoms of stricture. On examination with the finger, the canal of the rectum is found obstructed by a tumor with a capacious *cul de sac* around it, and with the natural passage of the bowel in its centre. *Treatment.*—Aperients, mild astringent injections, and the bougie, the point of which should be carefully guided into the orifice in the centre of the prolapsed portion.

XIII. Spasmodic Stricture of the rectum—known by great difficulty in evacuating the bowels, with spasmodic pain on doing so—is an affection about which but little is known. "It generally depends," says Mr. Mayo, "on a vitiated state of the secretions; and is more frequently relieved by a regulated diet and alterative medicines, and the use of injections, than by the employment of the bougie."

XIV. Permanent Stricture—a chronic thickening and contraction of the mucous coat of the rectum, so as to form a ring encroaching on its canal—is generally situated at from two inches and a half to four inches from the anus. More rarely it is met with higher up, or even in various parts of the colon. The *symptoms* are great pain, straining and difficulty in voiding the fæces,

which are passed in small, narrow, flattened fragments;—and on examination the stricture may in ordinary cases be readily felt. Irritation of the bladder and uterus, and pains or cramps in the legs, with headache and dyspepsia, are occasional additional symptoms. If this affection be unrelieved, it leads to ulceration of the rectum above the stricture, with a consequent aggravation of all the symptoms, and death from irritation. *Treatment.*—The remedies are aperients and injections, so as to produce daily soft unirritating stools,—and the bougie. A soft bougie, capable of being passed with moderate facility through the stricture, should be introduced once in three or four days, and be allowed to remain fifteen or twenty minutes; and its size should be gradually increased when a larger one admits of being passed. Instruments of every sort introduced into the rectum should be handled with the utmost gentleness. Nothing is gained by forcing a large bougie through a stricture. The cure is to be effected by the repeated and gentle stimulus of pressure,—so as to excite absorption,—not by mere mechanical dilatation. There are numerous fatal instances on record in which the bowel has been torn by bougies, and by that most dangerous and loathsome instrument the common clyster syringe, in the hands of careless or ignorant people. For the administration of enemata, the pipe should be only an inch and a half in length, with a large bulbous extremity. Or if in cases of stricture, or of obstinate costiveness with great accumulation of fæces, it is desirable to introduce a tube farther, it should be quite flexible like that of a stomach pump. But the natural sharp fold at the junction of the rectum with the sigmoid flexure, and the fact shown by Mr. Earle that the bowel not unfrequently makes a horizontal curve to the right before descending into the pelvis, render the introduction of bougies into the sigmoid flexure a very blind, hazardous proceeding, and one that is not often to be justified.

XV. Simple Ulcer of the rectum is generally situated on its posterior surface, just above the sphincter, where it may be felt with a slightly indurated edge. It generally begins at a small crack or fissure of the mucous membrane, caused by straining to get rid of hardened fæces. It produces great pain and difficulty of defæcation;—more or less discharge, occasionally tinged with blood, and irritation of the bladder. *Treatment.*—Laxatives, enemata of warm water, to which a little laudanum may be added when there is much pain,—and the application of mercurial ointment or solution of arg. nit. to the ulcer,—which failing, the sphincter must be divided and made to heal by granulation.

XVI. Scirrhous Ulcer of the rectum presents, according to Mr. Mayo, the following appearances: The mucous membrane disappears for a certain extent; and the muscular coat which is exposed is pale, hard, and gristly like cartilage. The symptoms are great pain, tenesmus, fetid discharge, and irritation of the

bladder. The treatment consists in the use of aperients, astringent and opiate injections,—and the very occasional passage of a bougie.

XVII. FUNGUS MEDULLARIS occasions all the symptoms of permanent stricture. It is known by the projecting fungous masses. The bowels must be kept loose,—pain and irritation must be allayed,—and the bougie be passed occasionally, to delay contraction of the passage. It is sometimes advisable to cut through the morbid growth, to provide for a time for the passage of the fæces,—but any attempt at extirpation is hardly to be thought of.

CHAPTER XX.

OF THE DISEASES OF THE URINARY ORGANS.

SECTION. I.—OF STRICTURE AND OTHER AFFECTIONS OF THE MALE URETHRA.

I. STRICTURE.—There are two kinds of stricture, the *spasmodic* and *permanent*; some add a third, the *inflammatory*.

(1) SPASMODIC STRICTURE is supposed to depend on spasm of the muscles, (Wilson's,) which surround the membranous portion of the urethra, at which point, according to most surgeons, the obstruction is invariably found. It generally affects those who are labouring under some degree of permanent stricture,—or who have had gonorrhœa repeatedly,—these therefore are the *predisposing causes*. The usual *exciting causes* are, exposure to cold and wet,—drunkenness, neglect of evacuating the urine,—and an acid, irritating state of the urine brought on by disordered digestion or errors in diet. The *symptoms* are,—sudden inability to make water,—and repeated straining efforts to do so. The bladder soon becomes distended, and can be felt as a tense round tumor above the pubes, and unless relief is soon given, the countenance becomes anxious, the pulse quick, and the skin hot.

The *inflammatory stricture* is a variety of the preceding, in which great pain and tenderness of the perinæum, and fever, are combined with spasm. It is generally caused by abuse of injections, or by exposure and intemperance during acute gonorrhœa. The treatment of this and of the spasmodic variety must be the same.

Treatment.—In the first place, the bladder must be relieved if possible. A silver catheter may first be introduced. But if that fails to pass, a small gum catheter which has been kept for some time on a curved wire, so that it retains its curve when the wire is withdrawn, or a catgut bougie, or a common bougie, may be tried

in succession. In introducing either of these instruments, the surgeon should be careful, 1st, to draw the penis well forwards on it, so as to stretch the urethra, and prevent the instrument from becoming entangled. 2ndly, To make the point slide along the upper surface of the urethra. 3rdly, On meeting with the obstruction, to press against it steadily, but very gently. And by one or other of these means used with delicacy and perseverance for five or ten minutes, the stricture will in most cases be made to yield.

If, however, they all fail, certain remedies for relaxing the spasm must next be resorted to.

(*a*) Venæsection, or leeches to the perinæum—if the patient is of an inflammatory habit, or complains of much pain; (*b*) A large enema, or some purgative of speedy operation—if the attack is caused by excess at table;—followed by (*c*) an enema of starch ʒiii with tinct. opii fʒß—fʒj,—or by repeated doses of opium or Dover's powder internally;—together with (*d*) immersion of the whole body in a hot bath (104° F.) till faintness supervenes,—are the most useful. But there are many others that are often of very great service; especially (*e*) the *tinct. ferri sesquichloridi* in doses of ɱx every ten minutes—(*f*) the cold affusion—(*g*) large draughts of lime water—(*h*) and belladonna smeared on the perinæum.—(*i*) The passage of a caustic bougie may be tried when the spasm is perpetually recurring. (*k*) Quinine has cured cases in which it occurred periodically.

If none of these means succeed, and the bladder has become exceedingly distended, it must be punctured. This operation may be performed in three places,—by the rectum,—above the pubes,—and by the perinæum. The first is to be preferred in cases of retention of urine by stricture,—the second when the prostate is enlarged,—and the third when urine is extravasated.

PUNCTURE OF THE BLADDER BY THE RECTUM is performed by placing the patient on his hands and knees,—introducing the left forefinger into the anus, and a curved trocar and canula by its side,—then feeling for the distended bladder just behind the prostate, and exactly in the middle line, and plunging the trocar into it—leaving the canula as long as may be necessary.

(2.) PERMANENT STRICTURE is a contraction of the urethra caused by chronic inflammation. Its most ordinary seat is the membranous portion;—but there are often one or more strictures anterior to that part. The extent of a stricture is at first only a few lines, although it may be extended to one or two inches. The *cause* is generally repeated gonorrhœa,—it may also be induced by repeated attacks of spasmodic stricture. *Symptoms.*—The patient first notices that a few drops of urine hang in the urethra, and dribble from him after he has buttoned up. Then he observes that the stream of water is smaller than usual, and forked, or scattered, or twisted, and that he requires a longer time and greater effort to pass it. Itching of the orifice and gleety discharge are not unfre-

quent concomitants. If the disease proceeds, the bladder becomes irritable,—obliging the patient to rise in the night to void his urine. He is liable to attacks of spasm with complete retention. In one of these, the urethra, which is always dilated behind the stricture, may ulcerate or burst,—giving rise to extravasation of urine,—or the bladder may burst. Rigors occurring in paroxysms like ague fits, are not uncommon. Finally, if the complaint is permitted to continue, the bladder becomes diseased,—the ureters dilated,—the kidneys disorganised,—and the patient dies in great misery from the continued irritation. *Treatment.*—If there is any derangement of the urine or of the general health, appropriate medicines should be given. But the stricture can only be cured by *mechanical means.* And these are five. 1. The bougie,—2. the catheter kept in the urethra,—3. the caustic bougie,—4. puncturation with the stilette,—and, 5. division from the perinæum.

1. In order to ascertain with precision the existence of stricture, the urethra should be examined with a common plaster bougie of a full size, *i. e.* one that will readily enter the orifice, and that will fill the urethra without stretching it. The surgeon takes the corona glandis in his left hand, and introduces the bougie (previously oiled and bent to the shape of the urethra) with his right—holding it loosely like a pen. If it meets with an obstruction, it should be slightly withdrawn,—then tried again. If it now seem to pass, the surgeon should relinquish his hold,—and then if it recoils, it is a sign that it has bent against the stricture;—whereas if it has entered the stricture it will be held, and require a gentle force to dislodge it. If after all it does not pass, a metallic sound or catheter may be tried, because a slight obstacle to the instrument at its first introduction must not be set down at once as stricture. The patient generally suffers somewhat from sickness and faintness on the first trial. When the stricture is clearly made out, the surgeon should mark and lay by a bougie that will just pass through it. In three or four days' time he introduces the same bougie again,—lets it remain a few minutes,—then withdraws it, and introduces another of a size larger, which he suffers to remain for ten or fifteen minutes. After three more days the process is repeated,—first using the instrument that was passed on the former occasion,—then one of a size larger; and this process repeated a sufficient number of times affords in most cases an easy, painless cure.

Metallic bougies or sounds are to be preferred to those of the ordinary soft materials, 1st, if the stricture is old and very hard and gristly; 2ndly, in cases of very irritable urethræ, because their smooth, polished surface is not so apt to cause spasm; 3rdly, in cases where a false passage has been formed, which these instruments, as they can be directed with greater precision, can be better made to avoid. They should be eight or nine inches long, slightly curved, and mounted on a firm wooden handle. Very small ones should be avoided.

2. If a small catheter is retained in the bladder for two or three days, the passage suppurates and dilates remarkably; just as the lachrymal duct does from the presence of a style. This method of cure is extremely speedy and efficient. It may therefore be employéd, 1st, when time is of much value; 2ndly, when the stricture is very gristly and cartilaginous; 3rdly, when the urethra is irregular, or has had a false passage made in it; 4thly, when the urethra is so irritable that severe rigors and fever are occasioned by the passage of the urine after the use of the common bougie. The catheter should be retained by means of two strings, which may either be fastened to the penis with sticking-plaster, or may be tied to the thighs, or may be passed backwards between the thighs, and be fastened to a band round the waist. It should be removed in three or four days, and a larger catheter should be passed after twelve or four-and-twenty hours, and should be repeated often enough subsequently to keep up the dilatation. In cases of stricture which will not suffer any instrument to pass, Mr. Guthrie recommends a bougie to be kept in the urethra, and to be made to press constantly against the anterior surface of the stricture. He says that this plan "has never failed in his hands to clear the urethra, and to effect a passage into the bladder." Mr. Liston, however, describes it as "a very futile and unsurgical proceeding," and one "not likely to be called for in the practice of a man with hands to act and a head to guide them."

3. The caustic bougie is a powerful agent in diminishing the irritability of strictures, and is advisable in cases where there is a perpetual tendency to spasm. It may also be applied to very firm strictures of small extent. But it should never be used till other means have failed, and never should be repeated more than three or four times about the same period,—for it is liable, if misused, to induce inflammation, abscess, spasm, hæmorrhage, and false passage. The manner of using it is this:—the distance to the stricture is measured by a common bougie,—then the caustic bougie is passed down to the same distance, and is to be pressed firmly and heavily against the stricture for a quarter or half a minute. The process should not be repeated in less than three days.

4. *Puncturation*, or division of the stricture by means of the *lanceted stilettes* invented by Mr. Stafford, may be resorted to with advantage in some cases of old stricture, especially if at the anterior part of the urethra. But if the stricture is far back, it is a blind, dangerous proceeding; and if any instrument whatever can be passed, it is unnecessary.

5. The operation of Opening the Urethra or Puncture of the Bladder by the Perinæum is not often required. It is absolutely requisite in cases of rupture of the urethra with extravasation of urine,—and may possibly (but very rarely) be expedient in cases of very old stricture with extensive urinary fistulæ. It is performed thus:—the patient is placed in the lithotomy posi-

tion; a grooved staff is passed down to the stricture, and the left forefinger, introduced into the rectum, is to feel for the urethra, and serve as a guide to the incisions. Then a straight bistoury is to be plunged in just above the anus to the depth of an inch, and made to cut its way out upwards in the middle line of the perinæum. The end of the sound should next be felt for and cut upon,—and the knife is then to be carried backwards through the stricture into the urethra beyond it, which is always more or less dilated. A gum catheter should then be passed into the bladder, and be retained there, so that the wound may heal over it and form a new passage. It should, however, be changed once in three or four days.

In whatever manner a stricture has been cured, the bougie should still be used at intervals, to prevent any fresh contraction.

II. CONTRACTION OF THE ORIFICE of the urethra, whether primary or caused by the cicatrix of an ulcer, must be counteracted by the frequent passage of a bougie. If the contraction is very great, a director must be passed into the canal, and the orifice be dilated by a slight incision downwards—a piece of gum catheter being worn till it is healed.

III. SOLID TUMORS in the course of the urethra, composed of indurated follicles, must be treated in the same manner as the scirrhous state of the corpus spongiosum, p. 164.

IV. ACUTE AND CHRONIC INFLAMMATIONS of the urethra, from whatever cause arising, differ in no respects in their symptoms, consequences, or treatment, from gonorrhœa and gleet.

V. HÆMORRHAGE FROM THE URETHRA, whether caused by mechanical injury, or by the separation of a slough made by a caustic bougie, must be suppressed by pressure. A flat piece of cork should be pressed by the patient against the perinæum far back, and be gradually moved forward till it lights on the right spot, and the dripping of blood ceases.

VI. URINARY ABSCESS is an abscess in the cellular tissue of the perinæum, caused either by the irritation of a stricture, or by slight ulceration of the urethra behind it, and the extravasation of a *small* quantity of urine. *Symptoms.*—The patient complains of rather more difficulty of micturition than usual—he is seized with shivering and fever, which latter speedily assumes a typhoid type—and more or less swelling and fluctuation is perceptible in the perinæum. *Treatment.*—The abscess should be opened immediately. A quantity of dark-coloured offensive pus will then be discharged, and the patient will soon be brought from the gates of death to comparative health.

VII. RUPTURE OF THE URETHRA, with *extravasation of urine*, may be caused by external violence—such as kicks on the perinæum—or by violent straining to pass the urine in cases of retention from stricture. In the latter case, the patient feels something give way, and his suffering from retention cease. But the fluid

passes into the cellular tissue of the perinæum, scrotum, and perhaps of the lower part of the abdomen—the tissue rapidly inflames and sloughs—the superjacent skin becomes red—then livid and vesicated—low typhoid symptoms come on, and the patient soon departs this life, unless proper measures are taken for his relief. A black spot on the *glans penis*, indicating that the urine has penetrated the *corpus spongiosum*, is a very fatal sign. *Treatment.*—A bougie or catheter must be passed as far as possible, and (as a stricture generally relaxes after the bladder is unloaded by any means) it may sometimes be passed into the bladder. Then the urethra must be opened and the stricture be divided in the manner before described, and a catheter be passed through the wound into the bladder, and be allowed to remain several days. At the same time free incisions must be made into any parts that are swelled or emphysematous—showing that they have been pervaded by the urine.

VIII. FISTULA IN PERINÆO, a communication between the urethra and the perinæum, consequent upon urinary abscess or extravasation, is prevented from healing by the passage of urine through it. *Treatment.*—Stricture, if any exist, must be dilated—and the patient should wear a catheter constantly, or, at all events, should introduce it every time he makes water. Thus the passage of urine through the fistula will be prevented. At the same time the fistula should be stimulated to granulate by injections of arg. nit. &c., or by the passage of a heated wire—and the external orifice should be occasionally touched with potass, so as not to allow it to heal before the whole track is closed—otherwise fresh abscess will form.

IX. FOREIGN BODIES in the urethra, whether calculi, or small bodies introduced from without, may perhaps be pushed forward by means of the fingers, aided by the patient's strainings,—or may be seized by forceps, and be brought out through the orifice, which must be slightly dilated if necessary. But if this cannot be done, the substance must be pushed back into the membranous portion, (if not there already,) and be extracted by an incision in the perinæum, for incisions in front of the scrotum are apt to leave irremediable fistulæ.

SECTION II.—OF THE DISEASES OF THE PROSTATE.

I. ACUTE INFLAMMATION of the Prostate is generally a consequence of acute gonorrhœa. The *Symptoms* are, great weight, pain, and throbbing at the neck of the bladder—tenderness of the perinæum—the gland feels swelled and tender on examination by the rectum—frequent, violent, and exceedingly painful efforts to make water. *Treatment.*—Rest in bed—cupping or leeches to the perinæum—or general bleeding if the patient is strong—hip-baths

—enemata of starch ʒii, laudanum ɜss every night—and the occasional passage of a very small gum catheter, if demanded by retention.

II. Abscess of the prostate may be suspected if rigors, and obscure swelling, or fluctuation in the perinæum, follow the symptoms of inflammation. In any such case, the swelling should be freely punctured with a bistoury. If left to itself, the abscess may burst into the rectum or the urethra, which latter will be indicated by a sudden discharge of pus with the urine. If the latter circumstance has occurred, the catheter should be used every time the patient passes his urine, in order to prevent it from entering and irritating the cyst. If the case is chronic, and the habit scrofulous, quinine and tonics, and small doses of cubebs, to act as a gentle stimulus on the parts, will be of service.

III. Chronic Enlargement of the prostate is extremely frequent in advanced life, and seems to depend on senile decay, rather than on any disease. The gland increases to from two to fourteen times its natural bulk, and becomes hardened. The middle lobe generally forms a projecting tumor at the neck of the bladder, and the prostatic portion of the urethra is flattened, lengthened, and curved abruptly upwards. The first *symptoms* are slowness and difficulty of making water, sense of weight in the perinæum, and tenesmus. Next, the bladder becomes irritable, and micturition is frequent. Then, as the patient cannot empty the organ completely, in consequence of the projection formed by the tumor, and as a portion of urine always remains behind and decomposes, the urine becomes ammoniacal. Next, the mucous coat of the bladder, irritated by the frequent strainings, and by the alkaline urine, inflames and secretes a viscid mucus. Finally, the obstacle continuing to increase, the bladder is constantly distended—the urine perpetually dribbles away—the ureters become dilated into subsidiary receptacles; the kidneys become disorganised, the patient's little remaining strength is exhausted, and he dies. Sometimes a fit of complete retention ensues, from exposure to cold or excess in venery. *Treatment.*—Medicines are of no avail to remove the enlargement of the prostate, although they may very likely be required for accompanying disease of the bladder or kidneys. The only thing to be done, is to introduce the catheter two or three times a day, so that the bladder may be completely emptied. The instrument will meet with an obstruction just at the entrance of the bladder, occasioned partly by irregularity of the urethra, partly by the projection of the third lobe. To avoid the latter, the instrument should be long, and have its point well turned up. In introducing it, the point should be made to glide as close as possible round the pubes, and the handle should be well depressed as it is entering the bladder, in order that it may ride over the projection. The finger should be introduced into the rectum to guide

it. The best catheter, if it can be used, is a small gum, which has been kept a long while on an iron wire of considerable curve; but a silver one of proper shape is more easy of introduction.

If the bladder has been long distended to the utmost, and the kidneys have become organically diseased in consequence, the sudden withdrawal of all the urine will be likely to be followed by irretrievable sinking. The urine should therefore be drawn off in small quantities at a time, and the strength be well supported with tonics, wine, and plenty of nutriment.

In the case of complete retention, if there are inflammatory symptoms, cupping from the perinæum and the hip-bath are indicated. If the catheter can be passed, it should be retained, because the bladder does not regain its contractility for two or three days, and the frequent introduction of the instrument would be irritating. If, however, the catheter cannot be passed by the natural route, it should be thrust through the projecting part of the gland, so as to make a new passage in the bladder—(or perhaps one of Stafford's *lanceted stilettes* may be advantageously employed for that purpose.) But if this cannot be done, the last resource is PUNCTURE ABOVE THE PUBES. This is easily performed by making a small incision through the linea alba just above the pubes, and then thrusting a long trocar and canula downwards and backwards into the bladder, where it is uncovered by the peritonæum. The canula must be retained, and the patient be kept on his back to prevent extravasation;—and no time should be lost in restoring the natural passage.

IV. CALCULI of the prostate are small reddish brown concretions of phosphate of lime formed in the ducts of the gland. They cause obscure irritation of the neck of the bladder, and difficulty of micturition. They may perhaps be felt by the finger in the rectum. Sometimes it may be possible to remove some of them with the urethral forceps—or if there are many contained in one cyst, to cut upon them from the perinæum; but in general the only thing to be done is, to keep the urethra well dilated with bougies, so as to favour their spontaneous escape.

SECT. III.—OF THE DISEASES OF THE BLADDER AND KIDNEYS.

I. ACUTE INFLAMMATION of the mucous membrane of the bladder is rarely a primary idiopathic affection. Most frequently it is a consequence of neglected or ill-treated gonorrhœa. The *symptoms* are, pain referred to the perinæum and sacrum—tenderness of the lower part of the abdomen—micturition exceedingly frequent, attended with great straining, and followed by an aggravation of the pain—a mucous or muco-purulent sediment in the urine, and fever. *Treatment.*—Bleeding—leeches or cupping on the lower part of the abdomen or perinæum—hip-baths and warm fomentations—

castor oil, so as to keep the bowels open without much straining — opiate glysters at night, calomel, opium, and antimony, (F. 6) three or four times a day, with saline draughts containing excess of alkali, (or F. 19,) in the intervals—provided that the urine is acid, (turning red litmus paper blue,) and its sediment yellowish and not adhesive. But if the urine be alkaline, (turning red litmus paper blue,) and deposit a dark-coloured adhesive mucus, vin. colchici ℥xx—xxx should be given three or four times a day instead of the calomel and alkalis.

II. Chronic Inflammation of the bladder (*catarrhus vesicæ*) is a very frequent consequence of irritation from stricture, diseased prostate, or stone. *Symptoms.*—The bladder irritable—micturition very frequent and painful—the urine loaded with mucus—which is sometimes tinged with blood, sometimes yellowish and puriform, but more generally grayish, excessively viscid, (so as to stick to the bottom of the chamber-pot when turned upside down,) and highly alkaline. In the early stages there is but little mucus, and the urine may remain acid; but as the disease advances, its quantity becomes enormous, and the urine is voided of a brownish hue, and of a most offensive ammoniacal odour. Very frequently the *triple phosphate* is deposited in abundance—or perhaps the mucous membrane may ulcerate, causing a horrid aggravation of pain—and finally disease of the kidneys ensues, and the patient dies. *Treatment.*—If there be a stricture, or stone in the bladder, or diseased prostate, they must be treated by appropriate measures. The patient should keep himself in the recumbent posture as much as possible. The pain and irritation should be allayed by opiate enemata or suppositories, or by sufficient doses of opium or other narcotics internally—and the bowels should be kept gently open without purging. There are certain remedies which act as gentle astringents and stimulants on the urinary organs. The most useful of these, according to Brodie, is the root of the *pareira brava*; an ounce of which should be boiled in three pints of water down to a pint, and the decoction be administered in doses of ℥iv ter die—or the extract of pareira in doses of gr. xxx ter die may be substituted. *Uva ursi*, or *buchu* in doses of an ounce or two of a strong infusion or decoction; or *oil of turpentine*, (℥xv,) or *chian turpentine*, (gr. ii,) or *cubebs*, (gr. xv,) or *copaiba*, (℥xx,) or *tinct. ferri mur.* (℥xv)—in the above small doses three times a day, are also remedies of similar virtues. Hyoscyamus or opium, and small doses of muriatic acid, if the urine is highly alkaline, may be added to any of them. Mercury and alkalis are contraindicated. Yet if the digestive organs are out of order, and the *urine is yet acid*, and the strength good, *very small doses* of either may sometimes be given with benefit. Stimulating plasters to the sacrum are mostly useful. Injections of an ounce or two of tepid water or poppy decoction, by means of an elastic bottle and catheter, must not be thought of when the

inflammation is acute, or the mucus bloody, although they greatly relieve the irritability of the bladder in chronic cases;—and injections of very dilute nitric acid (♏i—ii—ad ℥ij aq. destil.) thrown into the bladder, not oftener than once a day, through a gold catheter, and allowed to remain thirty seconds, are of great service when the urine is highly ammoniacal;—provided there is no tendency to active inflammation. Leeches or cupping may be required by occasional aggravations of the inflammation, but as a general rule are injurious.

III. Irritable Bladder.—Many cases described under this title are cases of chronic inflammation. Simple irritability,—a frequent disposition to pass the urine without any disease,—may be caused by an irritating state of the urine—or it may be the effect of mere nervousness. It is not uncommon in elderly people.

IV. Paralysis of the bladder may be caused by injury of the head or spine—it is often present in typhus fever—it may be caused for a time by any severe injury, especially of the legs—it generally remains for a few days after great distension of the bladder from prostatic disease or stricture—and it sometimes occurs suddenly in nervous sedentary people, who, if they let their bladder get filled beyond a certain point, find that they cannot empty it. It must be noticed, that in either of these cases, as soon as the organ becomes full, a little urine begins to dribble away through the urethra—and that the patient may perhaps be able to squeeze out a little by straining with his abdominal muscles, and may believe his bladder to be empty, although all the while it is enormously distended. No surgeon will fail to put his hand on the pubes when he sees the urine dribbling away. The obvious remedy is the catheter. There is one form of palsy of the bladder which is not unfrequent in hysterical women, and which consists in a deficiency of volition rather than of power. They are not unable to empty the bladder if they try—but they are unable to try. These cases must be treated with purgatives, stimulating enemata, and fetid medicines. If the catheter is not employed, the patient will generally begin to make water as soon as she suffers much from distension—but the bladder must not be allowed to go unrelieved too long.

V. Hæmaturia.—(1.) Hæmorrhage from the kidney may be caused by blows on the loins—or by the irritation of a renal calculus. The blood sometimes comes away in long worm-shaped clots, moulded by the ureters—sometimes is generally diffused through the urine, rendering it dark red. In the latter case, if the urine be boiled, it will coagulate, and leave the fluid of its natural colour. (2.) Severe hæmorrhage from the prostate or bladder may be caused by the rude introduction of instruments—especially if the parts were before diseased or congested; or it may proceed from the surface of an ulcer or fungoid tumor, of which latter it is often the earliest manifestation. When blood is derived from

the bladder, some portion of it generally flows pure, after the urine is discharged. *Treatment.*—If the hæmorrhage follow a mechanical injury, or if it be attended with inflammatory symptoms, venæsection and the acetate of lead are indicated. If it continues obstinately, astringents must be resorted to—especially alum with dilute sulphuric acid—the muriated tincture of iron—and powdered gall-nuts with opium. In cases of hæmorrhage from the bladder the catheter should be retained, to prevent both its accumulation in the bladder, and any straining in micturition. If coagulated blood is accumulated to any extent in the bladder, it should be broken up by injections of warm water.

VI. INFLAMMATION OF THE KIDNEYS is known by pain and tenderness in the loins, colicky pains in the belly, the urine scanty and high coloured, the bladder irritable; fever and great vomiting. It is generally caused by blows on the loins, or by the irritation of calculi. Bleeding, cupping, or leeches—castor oil and other mild aperients—calomel, opium, and antimony in repeated doses—warm baths, and mild diluent drinks, are the obvious remedies.

VII. CHRONIC INFLAMMATION of the kidneys, leading to softening, abscess, and disorganisation, may be a primary disease, or may be produced by extension of disease from the bladder—especially if the latter has become habitually distended through long continued stricture or enlargement of the prostate, and the ureters have become dilated into receptacles for the urine—so that all the strainings to evacuate the urine tell upon the kidneys. *Symptoms.*—The urine is voided of an opal, opakish colour, and becomes clouded with albumen when it is boiled, or when nitric acid is added to it. Sometimes it is tinged with blood, and sometimes it displays shreds or flakes of lymph, moulded probably into the shape of the ureters. As the disease proceeds it becomes yellowish and purulent, and deposits a quantity of pus if it remains at rest. Meanwhile the health and strength slowly sink; the patient complains of want of sleep and appetite—of pain and weakness in the loins, and of irregular shivering, and finally dies exhausted. It must be observed, that sometimes, even when the kidneys are primarily affected, the first and chief symptoms may be—frequent desire to make water—excruciating burning and cutting pains in the neck of the bladder and perinæum—pain and swelling of the testicles—and other symptoms of stone, or of disease of the bladder or prostate. If, however, in any such case the urine should be *highly albuminous*, and contain *very little mucus*, it may be surmised that the bladder is only sympathetically affected, although it will doubtless become really diseased in time. *Treatment.*—Blisters, issues, and setons to the loins—cupping and leeching, and small doses of Plummer's pill, or of colchicum, if the *urine be acid, and the strength permit*;—otherwise the uva ursi—capsicum in small doses, (gr. iii,) and the other medicines prescribed for chronic inflamma-

tion of the bladder, (p. 362,) or a strong infusion of wild carrot seed, will be the remedies most likely to be of service.

SECT. IV.—OF URINARY GRAVEL AND STONE.

Under particular diseased conditions of the system, certain insoluble substances are precipitated from the urine. They may either be voided in a state of minute division, constituting *gravel*, or may lodge in some part of the urinary organs, and concrete into *stone*.

There are two forms of gravel—the *red* or *lithic*, and the *white* or *phosphatic*.

1. RED GRAVEL is composed of the *lithic* or *uric* acid. This acid naturally exists in the urine in combination with ammonia, which renders it soluble. But, under particular circumstances, the muriatic acid is formed in the urine, and this, by combining with the ammonia, throws down the lithic acid in the form of minute red crystals like cayenne pepper. The urine in these cases is bright, transparent, and copper-coloured, like Madeira wine. The *symptoms* of A FIT OF THE GRAVEL are, pain in the loins, shooting down the bladder;—aching of the testicles and hip—irritability of the bladder, and scalding in micturition. *Causes.*—This affection is generally met with in inflammatory habits, and often in conjunction with gout. It may be produced by errors in diet, that cause the formation of too much acid in the intestines; or by circumstances that diminish the elimination of acid by the skin—indolent sedentary habits, and cutaneous disease. *Treatment.*—In the first place, the diet should be plain and temperate—consisting of meat once a day, and well-dressed vegetables. Fermented liquors should be taken very sparingly—a little good sherry is the best. All acescent substances, (i. e. disposed to the acetous fermentation) such as dumplings and sweet wines, should be avoided. But ripe fruits, especially strawberries, are rather beneficial; the natural acids that they contain not being injurious like vinegar. Secondly, the action of the skin must be promoted by plenty of exercise—and by baths of hot water, hot air, or of the vapour of sulphur, if there is any difficulty in procuring perspiration, or if the skin is diseased. Thirdly, the liver and bowels should be freely acted on by mercurials and purgatives, to which colchicum may be added if there is a gouty tendency. Moreover, the superabundance of acid in the system must be counteracted by alkalis. Some prefer potass, some soda, some magnesia. About two hours after a meal is the best time for taking them. The objection to soda is, that it forms an insoluble salt with the lithic acid—and to magnesia, that it is apt to concrete into hardened masses in the intestines—so that the *bicarbonate* of potass appears to be the best. The liquor potassæ is

more nauseous and injurious to the stomach, but not a bit more efficacious. The alkalis produce just as much effect if given in combination with *vegetable acids*;—such as the cream of tartar, seidlitz powders, &c.;—which may be given as aperients. Finally, benefit may be derived from diuretics of the milder sort—such as the alkaline salts last mentioned—and plenty of water.

II. WHITE GRAVEL is composed of the phosphates of magnesia, ammonia, and lime. The phosphate of magnesia, a highly soluble salt, exists naturally in the urine. But it sometimes happens that the *urea* (an essential constituent of that fluid) is exceedingly prone to decomposition, and becomes converted into ammonia. The ammonia, uniting with the phosphate of magnesia, forms an insoluble salt, the *triple phosphate of ammonia and magnesia*, which is thrown down in the form of minute brilliant white crystals. The urine in these cases is always more copious than natural—it scarcely if at all reddens litmus paper—it is pale, often whey coloured or slightly opalescent when voided; it has a nauseous smell, soon putrefies and evolves ammonia, and exhibits minute crystals of triple phosphate, which very frequently form a greasy-looking irridescent film on its surface. The *phosphate of lime* is another frequent ingredient in white gravel, causing it to appear powdery and *amorphous*, i. e. uncrystallised. This salt is derived from the mucous membrane of the bladder. It may either be formed after the triple phosphate, when the bladder has been for some time irritated by the diseased urine—or may be a primary deposit, caused by disease of the bladder, but inducing the secretion of triple phosphate subsequently by the continued irritation. *Causes.*—Phosphatic deposits always indicate a weakened, cachectic state of the system. They may be induced by any lowering agents—long fatigue, hard study, night-watching, or by mercury or alkalis given in excess. They are invariable consequences of disease or injury of the spinal cord, and of long-continued disease or irritation of the bladder, whether from stone or otherwise. *Treatment.*—The diet should be exceedingly nutritious, but plain,—consisting of animal food twice a day, and fermented liquors,—beer if it agrees with the stomach—if not, port or sherry. Thin, washy French wines, although acid, do more harm than good. The strength should also be invigorated by air and exercise, and bark or other tonics. The other remaining remedies are acids and opium. The vegetable acids—lemon juice in doses of ℥ss and so forth—are sometimes selected for children;—but the muriatic or nitric in doses of ♏v—x thrice daily—combined with opium to allay pain or irritation, are generally preferred. Opium in these cases may be given to a great extent, without interfering with digestion, or producing any ill effects whatever. Mercury, alkalis, soda water, neutral salts, and diuretics of all kinds, should be avoided. If the mucous membrane of the bladder is diseased, the

remedies mentioned in the preceding page (362) should be resorted to.

There are eleven kinds of urinary calculi—seven of which, however, are extremely rare.

I. LITHIC ACID calculi are generally oval, flattened, fawn or mahogany coloured, and on a section are seen to be composed of concentric laminæ. *Tests.*—This acid may be dissolved by boiling in *liquor potassæ*;—it burns away almost entirely before the blow-pipe, and, if digested in nitric acid and evaporated, leaves a scarlet residue (*purpuric acid*) which becomes purple on the addition of ammonia.

II. LITHATE OF AMMONIA rarely forms a calculus. *Tests.*—It may be known by the same tests as the preceding—and besides it evolves ammonia when treated by liq. potassæ.

III. PHOSPHATE OF LIME or *bone earth* calculi are rare. They are pale brown, friable, and laminated. *Tests.*—Soluble in nitric or muriatic acids, and precipitated by liq. ammoniæ—infusible except at a very intense heat.

IV. TRIPLE PHOSPHATE (*of ammonia and magnesia*) forms white or pale gray calculi, composed of small brillliant crystals. *Tests.*—Soluble in acetic or muriatic acid—evolves ammonia when treated with liq. potassæ.

V. THE FUSIBLE CALCULUS is formed of the phosphate of lime and triple phosphate mixed. It forms a white friable mass like mortar, and is very fusible.

VI. THE MULBERRY CALCULUS is composed of oxalate of lime. It is dark red, rough, and tuberculated. *Tests.*—Soluble in nitric acid, and if exposed to the blow-pipe, the acid is burned off, and quick-lime is left. The formation of this substance is supposed to be owing to the presence of nitric acid in the urine, which converts the lithic into oxalic acid. The urine is high-coloured and steadily acid, but *deposits no gravel*—and by this last circumstance, if there are symptoms of stone, it may be suspected to be the mulberry. The *Treatment* required to prevent its formation is the same as for the lithic.

VII. Besides the above, calculi are sometimes composed of *lithate of soda, carbonate of lime, cystic oxyde,* (a peculiar animal substance,) *fibrine* of the blood, and *silica.*

STONES IN THE KIDNEY are generally composed of lithic acid, and the urine consequently deposits the red gravel. They may however be mulberry or phosphatic. The symptoms are, pain in one or both loins—bloody urine after violent jolting exercise, and occasional fits of inflammation of the kidney. In most cases the calculus passes into the ureter;—it may, however, increase in size, completely fill up the pelvis and infundibula, and cause the kidney to waste away, or to suppurate—the abscess bursting either into the colon or in the loins. *Treatment.*—The urine should be examined to ascertain the species of calculus, and the measures adapted

to prevent its deposit should be resorted to. Plenty of diluents should be taken in order to increase the chance of its being propelled into the ureters; and *perhaps* it might be justifiable, for the same purpose, to recommend horse-exercise at intervals, so as to shake it from a fixed position. Cupping, counter-irritation, and opiate plasters, may be used to relieve pain in the back.

THE PASSAGE OF A STONE THROUGH THE URETER causes very severe pain, first in the loins and groin, subsequently in the testicle and inside of the thigh. The testicle is also retracted spasmodically. At the same time there are violent sickness, faintness, and collapse, only relieved when the stone reaches the bladder. *Treatment.*—The warm bath, large doses of opium, emollient enemata, and plenty of diluents, are the obvious remedies,—and an active purgative may perhaps be tried, if the process is slow.

STONE IN THE BLADDER produces the following *symptoms*:—1. Irritability of the bladder,—frequent irresistible desire to make water. 2. Occasional sudden stoppage of the stream of water, from the stone falling on the orifice of the urethra—the stream probably flowing again if the patient throws himself on his hands and knees. 3. Occasional pain at the neck of the bladder—always severest after micturition. 4. Pain in the glans penis. If the patient be a child, he is always pulling at the frænum to relieve it, so that the frænum becomes extremely elongated. 5. *Sounding.* But none of the above symptoms must be depended on alone. The existence of the stone must be made sensible to the ear and fingers by means of the sound—a solid iron rod like a catheter, but not so curved, and with a polished handle. This should be introduced—the patient lying on his back, the pelvis raised, and the bladder nearly, but not quite, full. It should be carefully moved about to examine every part of the bladder, and if there is a stone of any size it will most probably be heard to strike and felt to grate upon it. If nothing, however, is discovered, the patient may be made to sit upright, or the finger may be passed into the rectum; or a catheter may be introduced, and the stone may perhaps be felt to strike against it as the urine flows away. But if the symptoms are well marked, the surgeon must not be contented with one unsuccessful examination. On the other hand, the rubbing of the sound on the bladder, or on gravel entangled in mucus, must not be too hastily set down as signs of stone.

The symptoms of stone vary in their severity, 1, according to its size and roughness; 2, according to the state of the urine; 3, according to the condition of the bladder, whether healthy or inflamed. They may be very slight for years,—in fact, a little pain in micturition and bloody urine after riding may be the only inconveniences. But after a certain period the bladder suffers just as it does from any other cause of irritation,—the urine deposits a slight cloud of mucus,—the bladder becomes more and more irritable and finally inflamed,—the urine becomes alkaline, and loaded with viscid

mucus, and of course with the triple phosphate and phosphate of lime,—the strength fails, and finally, after years of suffering, sinks under the irritation.

The sources of vesical calculi are two,—1, from the kidney; 2, from the mucus of the bladder, if it is suffered to accumulate in cases of diseased prostate, and especially if foreign bodies are introduced into the bladder, so as to serve for a nucleus. In the last case, the stone is invariably phosphatic,—the phosphate of lime being contained in the mucus, and the triple phosphate secreted from the kidney subsequently. And all calculi, whatever their original composition, are sure to become coated with the phosphates, if they remain long enough in the bladder.

The *composition* of a calculus will be determined by the state of the urine. Its size may be appreciated, 1, by its composition—for the phosphatic are always the largest; 2, by the time it has existed; 3, by observing the force required to dislodge it from its situation; 4, it may be measured by passing the sound across its surface, or by the urethra forceps. Calculi may vary in weight from a few grains to forty-four ounces. The largest that was ever extracted entire weighed sixteen ounces, but the patient died; Sir A. Cooper was the operator. Mr. C. Mayo, of Winchester, extracted one weighing fourteen ounces and a half, but it was broken, and the patient lived. The number in the same patient has varied from one to one hundred and forty-two.

Treatment.—The indications are, 1, to get rid of the diseased state of the urine; 2, to allay pain and irritation; 3, to remove the stone. The first and second are to be accomplished by measures which have been already spoken of when treating of gravel and chronic inflammation of the bladder. The third may be executed in four ways, viz. by extraction of the stone through the urethra,—solution of it by injections,—lithotrity,—and lithotomy.

1. When a stone is known to have recently escaped from the ureter into the bladder, the urethra should be well dilated by the daily passage of large bougies,—the patient should drink plentifully till his bladder is thoroughly distended,—then he should lean forwards and pull out the bougie, and the full stream of urine which follows will probably bring the stone with it. Should this not succeed after some days, *Weiss' urethral forceps* should be tried. The patient being placed on his back with his pelvis raised, a catheter is to be introduced to draw off the urine, and five or six ounces of tepid water are to be injected afterwards. Next the forceps, being introduced, is to be made to feel for the stone, and the blades are to be cautiously opened over it and made to seize it. An index on the handle of the forceps will now show the size of the stone. If small it may be extracted at once,—if very large it must be left where it is,—if of a doubtful size it may perhaps be brought into the membranous portion of the urethra, whence it can be extracted by incision.

2. *Injections* of very dilute nitric acid, employed in the manner directed for chronic inflammation of the bladder, are extremely serviceable in cases of phosphatic calculi resulting from that state. They may entirely dissolve such stones, or at any rate may reduce them in size, so that they may be extracted by the urethra. But whether lithic calculi can be dissolved by any medicines taken internally, or by menstrua injected through the urethra, or by galvanism, must be decided by future experience.

3. *Lithotrity* is adapted for calculi under the size of a chesnut, in adults whose urethra, prostate, and bladder are healthy, *i. e.* who can hold their water some hours, and make it in a good stream.

4. *Lithotomy* has certainly hitherto proved much less fatal than lithotrity. It is attended with very little hazard to children. It should not be performed if there are signs of organic disease of the kidneys, highly albuminous or purulent urine, pain and weakness in the back, and hectic,—or if the prostate is ulcerated, or the bladder acutely inflamed—there being extreme pain in micturition, and blood mixed with the mucus of the bladder. The manner of performing these operations will be described in Part VI.

CALCULUS IN WOMEN is much less common than in men, and much more easily voided from the bladder. If, however, the calculus is too large to escape, the urethra must be dilated by Weiss' forceps for twenty-four or forty-eight hours, and then it may most likely be seized and extracted. Or it may be crushed by the screw lithotrite. Or if that plan is deemed inapplicable, an incision one-sixth of an inch in extent may be made with a *bistouri caché* through the orifice of the urethra towards the pubes,—and then the dilatation may be practised. If this succeeds no better, a grooved staff must be introduced, and an incision of sufficient length be made; but this operation is very liable to be followed by incontinence of urine.

CHAPTER XXI.

OF THE DISEASES OF THE MALE GENITALS.

SECTION I.—OF THE DISEASES OF THE PENIS.

I. PHYMOSIS is a preternatural constriction of the orifice of the prepuce, so that the glans cannot be uncovered. It may be a congenital affection, or may be caused by the healing of ulcers (p. 173.) *Treatment.*—If it causes any inconvenience, or obstructs the functions of the part, a director should be passed between the glans and prepuce near the frænum,—the skin of the penis should be drawn back as far as possible,—then a narrow, curved, pointed bistoury

should be passed along the groove of the director, and be made to slit up the prepuce. At the same time, if the edge of the prepuce is much thickened, it should be seized between the blades of a forceps and be shaved off.

II. PARAPHYMOSIS is said to exist when a tight prepuce is pulled back over the glans, constricting it and causing it to swell. *Treatment.*—The surgeon first compresses the glans with the fingers of one hand, so as to squeeze the blood out of it,—then pushes it back with that hand, whilst he draws the prepuce forwards with the other. If this fails, the constricting part of the prepuce must be divided with a curved pointed bistoury.

IV. CANCER of the penis may begin either on the glans or on the prepuce,—and invariably occurs in elderly persons who have had phymosis. It forms a foul, ragged, excavated ulcer, gradually destroying the whole organ, and contaminating the glands in the groin. *Treatment.*—The part must be amputated before the glands are affected. The surgeon stretches it out with one hand, and cuts it off with one sweep of a bistoury; bleeding vessels are then to be tied, and cold to be applied,—and after three or four days a piece of bougie is to be introduced into the orifice of the urethra, and to be retained there during the cicatrisation.

V. EPISPADIAS is a congenital malformation, consisting of an imperfect closure of the urethra on its upper surface. HYPOSPADIAS is a similar deficiency of the under surface. They sometimes may be relieved by paring the edges of the skin on each side the fissure, and uniting it by suture,—provided that the urethra is pervious to the end of the penis.

VI. TUMORS.—The natives of warm climates are liable to a sarcomatous growth of the cellular tissue of the penis and scrotum, forming an immense tumor in which those parts are completely buried. Poor Hoo Loo, the Chinese, had a tumor of this sort. Extirpation is the only cure,—and if the tumor is very large, no attempt can be made to save the penis and testicles.

SECTION II.—OF THE DISEASES OF THE TESTIS AND SCROTUM.

I. ACUTE INFLAMMATION of the testis is known by severe aching pain extending up to the loins,—great swelling and tenderness of the testis and cord,—fever, and vomiting. It may be caused by local violence, but more frequently occurs in conjunction with gonorrhœa through a translation or an extension of inflammation from the urethra. *Treatment.*—Bleeding if the habit is very plethoric,—the repeated application of numerous leeches,—cold lotions or warm fomentations, according to the patient's feelings,— a suspensory bandage to elevate the part,—purgatives,—and calomel, opium, and antimony in repeated doses, are the requisite measures. Any remaining hardness may be removed by friction with mercurial ointment.

II. CHRONIC INFLAMMATION is known by more or less hardness, swelling, tenderness, and occasional pain. Very often it commences in the epididymis. It may be a sequel of acute inflammation,—or may be caused by disease in the urethra, or disorder of the health. It sometimes depends on a venereal taint,—there being severe nocturnal pain, and secondary venereal affections of other parts. *Treatment.*—The patient must be confined to his bed or sofa,—mercury be administered till it begins to touch the gums,—the bowels be kept open, the diet moderately low. In syphilitic cases, and in fact in many others, F. 29, 30 may be given with benefit.

III. ABSCESS of the testis may be a result of chronic or scrofulous inflammation—very rarely of the acute. A puncture should be made as soon as fluctuation is clearly felt, and the skin is adherent. When an aperture is formed, spontaneously or by art, part of the tubular texture of the gland is apt to protrude in the form of a pink, fungous, irregular mass. This will probably be got rid of by pressure with strips of plaster, and by stimulating lotions and ointments,—but if not, it must be shaved clean off.

IV. SCROFULOUS INFLAMMATION commences with a deposit of tubercle in some part of the testis or epididymis, either into or between the tubuli. A slow, painless, nodular swelling appears externally, which after a time inflames and bursts, and gives exit to the fungous protrusion just mentioned. *Treatment.*—The health must be invigorated by tonics, alteratives and change of air, and the local actions be excited by stimulating lotions. When all the tubercular matter has been evacuated, the abscess heals of itself; but, before this occurs, the whole organ may be disorganised and rendered useless.

V. ATROPHY may be a result of acute inflammation, or of excessive venereal indulgence. The gland dwindles to the size of a pea. There is no cure.

VI. IRRITABLE TESTIS is a form of neuralgia. The testis and cord are attacked with fits of excruciating pain, which leaves them tender and slightly swollen. The *treatment* must be the same as that of neuralgia generally. All the secreting and excreting organs must be set in order. Violent purgatives in general do mischief. A few leeches,—the application of intense cold, (F. 12,)—counter-irritants, and opiate or belladonna plasters,—sometimes afford relief. The internal remedies most likely to do good are quinine, arsenic, and other tonics. But in every case the cure is uncertain and tedious, and many patients have been compelled by the constant pain to seek relief in castration.

VII. THE HYDATID DISEASE is very rare, and occurs almost exclusively to adults. The testicle swells exceedingly, and its interior is filled with a number of cysts containing a watery fluid. This affection is incurable, but not malignant. When the part becomes of unsightly magnitude it must be removed.

VIII. MALIGNANT DISEASE of the testis is almost invariably medullary sarcoma, very rarely scirrhus. At first the gland swells and becomes very hard and heavy,—it is scarcely, if at all, painful or tender, and merely causes slight aching in the loins by its weight. Subsequently it enlarges rapidly and feels soft,—the cord swells,—there are occasional darting pains, — and protrusion of fungus, affection of the lumbar glands, and cachexia and death soon follow in their ordinary course, (p. 185—190.) This disease is to be distinguished from hydrocele by its opacity and weight,—and from chronic inflammation or the hydatid disease by the darting pains, swelling of the cord, and cancerous cachexia. It may further be distinguished from chronic inflammation by the fact, that neither mercury nor any other remedy produces any benefit. *Treatment.*—Castration should be performed before the cord is affected.

IX. CASTRATION is performed thus:—the scrotum being shaved, the surgeon grasps it behind to stretch the skin, and then makes an incision from the external abdominal ring to the very bottom of the scrotum. If there is any doubt as to the nature of the disease, he may next open the tunica vaginalis to examine the testis. Then he separates the cord from its attachments, and an assistant holds it between his finger and thumb to prevent it from retracting when divided. The operator now passes his bistoury behind it and divides it,—and seizing the lower portion draws it forwards and dissects out the testicle. The arteries of the cord, and any others requiring it, are then to be tied; and the wound must not be closed till all bleeding has ceased.

X. HÆMATOCELE signifies an extravasation of blood into the tunica vaginalis in consequence of injury. It is sometimes combined with ecchymosis of the scrotum. If the quantity extravasated is small, bleeding and cold lotions may cause it to be absorbed. If large, a puncture should be made and a poultice be applied for the blood to ooze into gradually.

XI. HYDROCELE signifies a collection of serum in the tunica vaginalis. It forms a pear-shaped swelling, smooth on its surface, fluctuating if pressed, free from pain and tenderness, and causing merely a little uneasiness by its weight. The epididymis can be felt on the posterior surface of the tumor near the bottom. On placing a lighted candle on one side of the scrotum, the light can be discerned through it. *Causes.*—Hydrocele may be a sequel of inflammation of the testis, but more frequently arises without any local cause. It is often supposed to follow strains of the loins or belly. *Diagnosis.*—Solid enlargements of the testis may be distinguished from hydrocele by their weight, solidity, and greater painfulness, and by the absence of transparency. The diagnosis from hernia will be found at p. 341. *Varieties.*—It sometimes happens that the tunica vaginalis preserves its communication with the abdomen, and then becomes the seat of hydrocele, forming a cylindrical tumor extending up to the abdominal ring. On raising

and compressing it, the fluid is slowly squeezed into the abdomen; and slowly trickles down again afterwards. This case is liable to be complicated with a *congenital* or *encysted hernia*, to prevent which a truss should be worn. Sometimes the transparency and fluctuation of hydrocele are absent in consequence of a thickening of the tunica vaginalis, which may be known, according to Brodie, by noticing that the thickened membrane forms a projection along the epididymis,—whereas in solid enlargements of the testicle the projection of the epididymis is lost. Sometimes the tunica vaginalis is partially adherent to the testicle. Sometimes loose cartilages are found in the sac,—they are easily removed by a slight incision. *Treatment.*—The remedies for hydrocele are threefold. 1. Strong discutient lotions (F. 16) which sometimes assist the cure in children. 2. Evacuation of the serum, or the *palliative cure*. This may be accomplished by a puncture with a common lancet, or trocar; but the method most commonly adopted at present, consists in making a number of punctures with a large needle, so that the fluid may escape from the tunica vaginalis into the cellular tissue of the scrotum. This *palliative treatment* is always sufficient for children, and sometimes for adults. But for the latter, it is generally expedient to resort at once to (3) the *radical cure*; which is performed by injecting certain stimulating fluids, or introducing foreign substances into the tunica vaginalis, in order to excite a degree of inflammation sufficient to destroy its secreting faculty. It must not be forgotten, however, that this *radical cure* is totally inadmissible, if the testis is diseased, or if the hydrocele is complicated with an irreducible hernia, or if the tunica vaginalis preserves its communication with the abdomen. Mere thickening from *previous* disease is, however, no objection. *Operation.*—The surgeon grasps the tumor behind, and introduces a trocar and canula into the sac—pointing the instrument upwards, so that it may not wound the testicle. He next withdraws the trocar, at the same time pushing the canula well into the sac, so that none of the fluid that is to be injected may pass into the cellular tissue of the scrotum. When all the serum has escaped, he injects from two to four ounces of some stimulating fluid through the canula, by means of an elastic bottle fitted with a stop-cock. Equal parts of port wine and water or zinc lotion (F. 15) are commonly used. When it has remained from three to five minutes, according to the degree of pain which it causes, it is suffered to flow out, and the canula is withdrawn. Some degree of inflammation follows, and more effusion into the sac—but the latter generally disappears in a fortnight or three weeks. If the cure is not quite perfect, the operation may be repeated after a few weeks.

XII. HYDROCELE OF THE CORD is a transparent, fluctuating, encysted tumor of slow growth, containing a clear water. If large, it must be punctured.

XIII. VARICOCELE signifies a varicose state of the spermatic

veins, which may be felt like a bundle of worms. *Treatment.*—Great relief may be afforded by tight suspensory bandages, cold lotions, and purgatives—or by pinching up the loose skin of the scrotum below the testicles, and confining it with a steel ring, as proposed by Mr. Wormald. If this does not succeed, the enlarged veins may be exposed and cut across.

XIV. CHIMNEYSWEEPER'S CANCER is a foul ragged ulcer of the scrotum, with the skin hardened and tuberculated around. It rarely, if ever, occurs till after the age of thirty. It commences as a small wart, and is caused by the irritation of soot. The whole of the ulcer, and of the diseased skin around it, must be extirpated—but it is rarely if ever necessary to remove either of the testicles.

SECT. III.—OF IMPOTENCE.

IMPOTENCE in the male may depend on a variety of conditions. (1.) It may be caused by absence, or mutilation, or malformation, or original weakness and want of developement of the genital organs. (2.) After a severe and tedious illness, the genitals may remain incapable of performing their functions, long after the restoration of the health and strength in other respects. Steel and other tonics, with cantharides, musk, spices, eggs, and oysters, are the remedies. Phosphorus in doses of gr. $\frac{1}{10}$ dissolved in oil, is said to be a potent *aphrodisiac* in these cases. (3.) It often happens that a young man the first time he yields to carnal temptation—or that a newly married man on the night of his nuptials finds himself incapable of accomplishing his wishes—through awkwardness, or timidity, or over anxiety on his own part, or, perhaps from something disagreeable in his bed-fellow. He straightway fancies himself impotent—and if he applies to one of the advertising scoundrels, will no doubt be told that he is so. The surgeon should inform him, that his case is by no means uncommon—that most other men feel the same incapability at times, and that he will be well enough in a few days, on taking some innocent medicine which he must be provided with. (4.) The most common cases of impotence are those produced by premature and excessive venery. Such patients either have lost the power of erection—or, perhaps, a discharge of a thin fluid follows it immediately. General tonics, cold bathing, dashing cold water upon the genitals, and *perfect chastity*—so as to avoid all excitement of the parts—are the necessary measures, although they will not often be of much service.

CHAPTER XXII.

OF THE SURGICAL DISEASES OF THE FEMALE GENITALS.

I. Young female children are sometimes subject to mucous or purulent discharges from the parts at the entrance of the vagina; which may also perhaps be excoriated. Purgatives and tonics—perfect cleanliness, and black wash, or any mild astringent lotion, are the remedies.

II. Noma is a phagedænic affection of the *labia* of female children, precisely resembling the *cancer oris*, (p. 304,) and manifested by vivid erysipelatous redness—foul phagedænic or sloughing ulcers, and great constitutional disorder of a low typhoid cast. It is very frequently fatal. It must be treated by purgatives, followed by bark, wine, and the mineral acids. Whilst there is much irritation and pain, poppy fomentations and poultices are advisable. But if the ulcers spread rapidly and the debility is great, stimulating applications, lotions of dec. cinchonæ, or F. 17, 26, 39 are preferable. If the sloughing proceeds notwithstanding, the diseased parts should be destroyed by strong nitric acid. The surgeon must be very careful not to mistake this or the preceding affection for the venereal disease;—an error common enough among parents.

III. Vesico-Vaginal Fistula is a communication between the bladder and vagina. It generally results from sloughing of the parts after a tedious labour. As soon as it is discovered, the patient should be made to lie on her face—a catheter should be constantly worn in the urethra, and an oiled sponge in the vagina, and the bowels should be kept moderately loose. By these means the natural contraction of the parts will be aided. After some weeks, it will be expedient to pare the edges of the fissure, and unite them by suture—or if this fails, to touch them frequently with nitrate of silver, or a heated iron. To perform these operations, the vagina must be dilated with a speculum.

IV. Recto-Vaginal Fistula must be treated by constantly wearing a sponge in the vagina so as to prevent the passage of fæces through it, and by mild laxatives, (F. 42.) If after a time the aperture does not close, it must be treated as in the last case. *Complete laceration of the perinæum into the anus*, is attended with distressing incontinence of fæces, and is prevented from healing by the action of the sphincter. Hence it is necessary to divide the

sphincter on each side of the laceration, and to prevent these new wounds from uniting, by placing a few threads of lint in them, until the laceration has united.

V. A VASCULAR EXCRESCENCE, varying in size from that of a large pin's head to that of a horse-bean—is liable to grow from the female urethra. It causes great distress through its exquisite sensibility. It should be cut off, and the potassa fusa be applied to the surface to prevent its reproduction.

VI. UTERINE POLYPUS is a pear-shaped tumor covered by mucous membrane, and attached by a narrow neck to some part of the uterus. The symptoms that it produces are those of uterine irritation—bearing down pains—menorrhagia—and, after a time, fetid discharges. On examination, an insensible tumor is found partially or entirely protruding through the os uteri. If it projects much into the vagina, the surgeon must carefully feel for the os uteri, and ascertain that the neck of the polypus is either attached to some part of it, or that it passes clear into the womb. Inversion, or prolapsus of the womb, must not be mistaken for it. *Treatment.*—A ligature should be twisted tightly round its neck, but not too near the womb, by means of the double canula invented for that purpose by the late Dr. Gooch.

VII. IMPERFORATE HYMEN.—Sometimes this membrane completely obstructs the vagina, and causes the menstrual fluid to accumulate and distend the uterus. The impediment is easily got rid of by a crucial incision. All the black treacly fluid that has accumulated should be immediately washed out, otherwise it might putrefy, and cause typhoid fever and death.

VIII. The labia may be the seat of acute inflammation, and of encysted tumors, and sarcomatous or fatty enlargements. The treament of these cases requires no distinct comments. The clitoris and nymphæ, if they grow to an inconvenient size, should be curtailed by an incision—and if they are affected with scirrhus, should be entirely extirpated at an early period.

CHAPTER XXIII.

OF THE DISEASES OF THE BREAST.

1. ACUTE INFLAMMATION of the breast is known by great swelling, tenderness and pain, and fever. These symptoms are soon succeeded by shivering, and formation of matter. The abcess is

very slow to point. This affection may occur at any period during lactation. It may be caused by cold—by too stimulating a diet—or by neglect in suckling. *Treatment.*—The bowels should be freely kept open by saline purgatives—plenty of leeches should be applied as soon as possible, and *tepid* fomentations or poultices after them; the milk should be drawn off, if it can be done without very much pain, and Dover's powder should be given to allay restlessness. As soon as fluctuation is well established, a puncture should be made. The aperture after a time discharges a milky fluid. If it is long in healing, weak acid lotions should be injected into it.

II. CHRONIC INFLAMMATION generally attacks one or two lobules only, causing them to swell into firm tumors, which, on examination with the finger, are felt to be composed of numerous little granules. The whole gland may however be affected. There is very little tenderness or pain, except at the time of menstruation. This affection is distinguished from malignant disease, by the circumstance that the patient is generally young, without the leaden look of cancer, and that the tumor is more diffused, and not so hard. *Treatment.*—The appetite and digestion—the state of the liver and bowels, and, above all, of the uterine system, must be regulated by Plummer's pill, aloes, steel, and other alteratives, aperients and tonics. Occasional leechings—cold lotions—issues in the back—mercurial plasters containing a little belladonna—and in indolent cases, friction with weak mercurial ointment—are the requisite local remedies. Marriage is almost a specific.

III. IRRITABLE BREAST is a neuralgic affection resembling the irritable testis. Extreme pain and tenderness, aggravated at the menstrual period, with occasional heat and slight swelling, are the symptoms. This, like the other affections of its class,(p. 254,) is extremely unmanageable, and may remain for years. *Treatment.*—Steel, aloes, and other tonics and emmenagogues—especially the ferri ammonia—chloridum in doses of gr. ii ter die—with change of air, marriage, and other means for the improvement of the health,—are the chief remedies. Leeches, cold and warm applications—mercurial, belladonna and other plasters.—issues, blisters, and other local measures, sometimes do good, but as often the reverse.

IV. LACTEAL TUMOR.—Sometimes a lacteal duct becomes obliterated, and the milk accumulates in it, forming an oblong fluctuating tumor near the nipple. If this is punctured, milk will continue to be discharged during lactation, and after the child is weaned it will dry up and heal.

V. SORE NIPPLES.—Excoriations and chaps about the nipples, not only cause great pain and inconvenience in suckling, but are a frequent cause of acute inflammation, by deterring the mother from allowing the child to suckle so freely as it ought. Borax and honey—or powdered borax sprinkled on the part—lotions of alum,

sulphate of zinc, or nitrate of silver, or arrowroot and cream, are the best applications. The nipple should be defended from the clothes, and from the child's mouth by a wooden or caoutchouc shield. Women who are subject to this affection, should frequently wash the parts with salt and water during pregnancy.

VI. THE HYDATID DISEASE consists in the developement of a number of cysts in the gland. Sometimes the cysts are developed *by* the gland—being lined with a vascular membrane, and containing a yellow serum. Sometimes they consist of hydatids—parasitic animalculæ, composed of thin bladders filled with a clear water, which are developed *in* the gland by their own vital powers, and are capable of engendering other smaller hydatids within themselves. The diagnosis of this affection is obscure. At first it occasions a hard tumor resembling that of chronic inflammation, and unattended with pain, except at the menstrual period. Subsequently fluctuation is felt at different parts—and when any cyst has acquired a considerable magnitude, it ulcerates, discharges its fluid, suppurates, and contracts. *Treatment.*—If there are but one or two cysts they may be punctured, and then they will suppurate and contract. But if the whole gland is involved, it should be removed. The inconvenience arising from its bulk, and the irritation caused by the ulceration of the cysts, will thus be got rid of. At the same time, the chance that this, like other new structures, may assume a malignant action, is an additional reason for the operation.

VII. SCIRRHUS generally commences as a hard, circumscribed, movable swelling in some part of the breast. In its early stages, it is not often tender or painful. After a few weeks or months, however, it becomes affected with paroxysms of violent lancinating pain, which are most apt to occur about the period of menstruation. Not unfrequently a little bloody fluid is discharged from the nipple. The cellular tissue and fat about the gland often become atrophied, so that the diseased breast is smaller than the sound one, and the nipple is generally drawn in, and the skin around it puckered like a cicatrix. The progress and termination of this disease have been already described, (p. 186.) The tumor adheres to the skin, and to the muscle beneath, so as to become fixed and immovable. After a time it ulcerates, and forms a cancer. The glands in the axilla, and sometimes those in the neck, enlarge, and the arm swells and becomes œdematous from the obstruction to its circulation. The ribs and pleura become scirrhous; water is effused into the chest—the breathing become difficult—the patient suffers from rheumatic pains in the bones, and at last dies. *Diagnosis.*—In well-marked cases, this disease cannot be mistaken. The stony-hard, movable swelling in its early stage, or the shrunken gland and retracted nipple subsequently,—the age about forty,—the leaden, sallow complexion,—the weakness and cachexia,—the lancinating pain,—and the circumstance (which very often

happens) that the patient's mother or sisters have suffered from cancer,—all distinguish it. But there are several circumstances which may render the diagnosis doubtful. (1) In the first place, the scirrhous deposit may be attended with more or less common inflammatory pain, tenderness, and swelling, so that it loses its characteristic hardness, and becomes blended in its outline with the surrounding tissues, and exactly resembles the swelling arising from chronic inflammation. (2) It may occur in a young female between twenty and thirty. (3) The effect of remedies may be deceitful. For although no medicine is capable of causing absorption of a schirrhous deposit, yet it may diminish the inflammatory swelling around, and so cause temporary decrease of the tumor. *Treatment.*—The local and general treatment of scirrhus of the breast must be conducted on principles laid down in the section on Scirrhus generally. Extirpation is the only remedy, and provided the diagnosis is clear, the sooner it is done the better. The circumstances which contraindicate an operation are also detailed in the same section.

VIII. MEDULLARY SARCOMA of the breast is generally combined with more or less scirrhus, and rarely exists alone. It forms a large rapidly-increasing tumor; lobulated on its surface; and the projecting parts yield an elastic sensation. This affection may be distinguished from scirrhus by its more rapid growth and greater softness. It is often difficult in its early stage to distinguish it from innocent chronic tumors, more especially as the latter may after a time degenerate into malignant action. *Melanosis* and *gelatiniform sarcoma* (p. 190) are sometimes found in the breast.

IX. EXTIRPATION OF THE BREAST is thus performed:—the patient being placed in a convenient position, sitting or reclining, an assistant takes the arm of the affected side and holds it out, so as to put the pectoralis on the stretch. The surgeon then makes a semi-elliptical incision below the nipple along the lower border of the pectoralis major, and another on the upper and inner side of the nipple, so as to include that part between them. He next dissects out the lower and outer part of the gland, quite down to the pectoralis, (taking care not to get behind that muscle,) and then, cutting from below upwards, he separates the remainder. If an adjacent gland is enlarged, the incisions should be managed so as to include it also. When the mass is removed, its surface should be wiped and examined, and the wound should also be well examined to ascertain that no hardened or discoloured portions of cellular tissue or of muscular fibre are left behind. Arteries are then to be tied, and the patient to be put to bed,—and when all oozing has ceased, a few strips of adhesive plaster may be applied.

Boys and girls about the age of puberty are subject to slight swelling and tenderness of the breast, which, however, may be soon got rid of by plasters of empl. ammoniaci cum hydrargyro.

Men occasionally suffer from malignant disease of the breast, which, however, manifests itself in the same manner, and requires the same treatment, as it does in the female.

CHAPTER XXIV.

OF SPINA BIFIDA, CLUB FOOT, AND OTHER DEFORMITIES.

I. SPINA BIFIDA, or *hydrorachitis*, is an affection depending on want of developement of the spinous processes and laminæ of some of the vertebræ, generally the lower dorsal or lumbar. The spinal membranes, deprived of their ordinary support, yield to the pressure of the fluid which they contain, (which also is secreted in unusual quantity,) and bulge out, forming a fluctuating tumor in the middle line of the back. The legs are often palsied. If left to itself, the tumor enlarges, the skin becomes distended, inflames, and ulcerates,—the fluid is discharged,—the spinal membranes inflame, and the patient dies. *Treatment.*—Moderate support by properly-adjusted trusses and bandages, and occasional punctures with a grooved needle when the tumor is much distended, are the only remedies.

II. WEBBED FINGERS.—This is a deformity consisting of an union of the fingers to each other. It may be congenital, or may be caused by burns. It is a most intractable affection. Mere division of the connecting skin is not of much avail. The fingers almost inevitably grow together again when the wound heals. In order to counteract their union, a flap of skin may either be brought from the dorsum of the hand and be engrafted between the fingers, —or, as Mr. Liston proposes, a perforation may first of all be made in the connecting skin near the roots of the fingers, and be prevented from closing by keeping a piece of cord in it till the edges have healed, and then the remainder of the connexion may be divided.

III. WEAK ANKLES.—In this affection the foot is flattened, its arch is sunk, and the astragalus forms a projection below the internal malleolus, rendering the internal border of the foot convex instead of concave. In bad cases the inner ankle almost touches the ground, and the patient walks with great pain and lameness. This affection depends on a weakness and relaxation of the bones and ligaments. It is sure to be brought on, if weakly children are put upon their legs too soon. It is more common amongst girls

than boys—partly from their greater delicacy—partly because they have not the support of leather boots — partly because they are taught at an early age by ignorant governesses and dancing masters, that it is necessary for them to turn their feet out as much as possible, as the very first step towards elegance in dancing or walking. Thirty years ago it was a common practice to make school girls sit for an hour every day in a kind of stocks, with their feet turned outwards, so as to be almost in a straight line with each other. Children, however, if left to nature, stand with their toes slightly turned inwards—the position in fact which is the firmest, and most calculated to prevent this distortion whilst the bones are yet soft and yielding. *Treatment.*—The patient should wear shoes or boots with high heels, and with the inner edge of the sole much thicker than the outer. He should also be directed to turn the foot out very little, if at all. Benefit may also be derived from well-applied bandages. In severe cases the patient should wear a tightly fitting boot, with a piece of steel or whalebone fastened to the sole, and passing perpendicularly upwards to the middle of the inner side of the leg.

IV. CLUB FOOT (*Talipes varus*) is a peculiar deformity, in which the heel is raised, and the inner edge of the foot turned upwards and inwards,—so that the patient walks on the outer edge, and in confirmed cases on part of the dorsum of the foot. The limb is generally weak, the bones small, and the muscles wasted. One limb only or both may be affected, and the malformation may either be congenital, or may be acquired during life. *Causes.*—The *essential cause* appears to be a contraction and rigidity of the gastrocnemii,—and this rigidity may depend, (1) on a state of *rigid atrophy*—the muscle becoming short, rigid, and inextensible, through some defect in its nutrition or supply of nervous influence; (2) on the rigidity and wasting consequent upon acute inflammation or abscess in the leg. *Varieties.*—Sometimes the heel merely is raised (*talipes equinus.*) Sometimes (although rarely) the foot is turned outwards instead of inwards (*valgus.*) *Treatment.*—During infancy, this malformation may often be rectified by constantly wearing a properly constructed shoe, with splints adapted to the leg. And even at a more advanced period much may be done by the same means, combined with friction of emollient substances over the rigid muscles. But the most expeditious method of cure consists in the division of the *tendo Achillis.* This operation is easily performed by thrusting a very narrow knife through the skin on one side of the tendon, then turning its edge against the latter so as to divide it—the foot being kept well on the stretch during the division. The external wound is thus extremely small, and scarcely a drop of blood is lost. After the operation, the heel should be brought down, and the foot be kept extended in its proper position by means of a suitable apparatus, so that the interval between the divided ends of the tendon may be filled up with new matter.

V. CONTRACTION OF THE FINGERS generally depends on shortening and rigidity of the palmar aponeuroses and tendinous sheaths —or on a ligamentous degeneration of the cellular tissue on the palmar aspect of the fingers. *Treatment.*—Friction with oily liniments and extension upon splints, may be of some service. But the following operation will be of more: a longitudinal incision may be made through the skin on the palmar surface of the first phalanx, then the edges of the wound being held asunder, a curved bistoury may be passed under the contracted tissues so as to divide them.

VI. It often happens that one of the toes is permanently elevated; and rides over its neighbours, from the habitual use of narrow boots; and the upper surface of this toe being peculiarly exposed to friction is generally covered with corns so painful, that many persons have been compelled to have the part amputated. Division of the extensor tendon may, however, enable the toe to be brought down into its place, and prevent the necessity of its removal.

In cases of *spurious anchylosis*, (p. 230,)—that is to say, stiffness of joints depending on rigidity of the surrounding tissues,—or on permanent contraction of the flexor muscles owing to their having been long kept in a fixed position,—division of the tendons of the contracted muscles will do much towards restoring the mobility of the joint. The tendons of the hamstring muscles have recently been divided with great success in cases of stiffened knee.

PART VI.

OF THE OPERATIONS OF SURGERY.

CHAPTER I.

OF OPERATIONS IN GENERAL, AND OF THE EXTIRPATION OF TUMORS.

(1) THE APPARATUS necessary for operations in general comprises one or more bistouries, scalpels, or other specific cutting instruments; a dissecting forceps, a tenaculum, and small forceps (which should have spring or catch) to take up arteries; plenty of well-waxed ligatures, curved needles threaded, fine sponge, water both warm and cold, wine and hartshorn in case of faintness, a sufficient number of assistants to restrain the patient's struggles, to administer cordials, to hand the different instruments to the surgeon, or to assist him in other respects,—a good light, and a bed or table with pillows or cushions to make the patient's position as easy as possible.

(2) INCISIONS.—In making incisions, there are several points that demand attention. First of all, the manner of handling the bistoury,—which, as systematic writers say, may be held either like a common dinner knife,—or like a pen,—or like a fiddlestick. The two first positions are those most used—the third is employed in cutting into the different layers over a hernial sac, and in sundry other delicate operations. Secondly, before commencing an incision, the skin must be gently stretched and steadied with the points of the fingers, otherwise it will be dragged along by the knife, and the incision will be ragged, and shorter than was intended. Thirdly, in cutting through the skin, the knife should be passed in at right angles to the surface, and should be at once carried down to the subcutaneous tissue—then the blade should be

inclined downwards, and be made to cut through the skin to the requisite extent,—and lastly, as the incision is finished, the instrument must be again brought to a right angle with the surface. By these means the whole thickness of the skin will be divided, both at the beginning and end of the incision. Nothing can be more painful than a partial division of the skin. The operator should always incise the skin as speedily as possible, for it is the most painful part of every operation. He should also take care to make it quite as long as will be required—and rather too long than too short. To pause in the middle of an operation, and enlarge the incision in the skin, is most awkward on the surgeon's part, and most cruel to the sufferer. The author has not sufficient space to detail all the tedious varieties of incisions that are enumerated in systematic treatises. It is of little use to say that they may be made by cutting from without inwards,—or by first plunging in the instrument, and then cutting outwards (as in bleeding,)—or that they may be simple or compound—straight, curved, or angular. It may be noticed, however, that when two incisions are to be made to meet near their extremities, (as, for example, the two semi-elliptical incisions in amputation of the breast,) the second should fall into the first *nearly* but *not quite at its extremity*, so that there may be no little isthmus of skin left undivided between them. Again in making a V or T incision, the second cut should be directed *towards* the first—and the angle of a V incision should if possible be always dependent.

(3) The Preparation of a patient for an operation (in cases admitting of delay) is a most important element in its success. The object is to have every organ and every function in as healthy a state as possible, and vascular action a little, but not too much, below par. For the full-blooded and inflammatory bleeding will be requisite, and in all cases recourse should be had to abstinence, aperients, and gentle alteratives, with or without small doses of sedatives, till the pulse has become quiet, the tongue clean, the bowels regular, the liver, kidneys, and skin in good order, and the mind cheerful. Moreover, it is best not to perform an operation in very cold weather if it can be avoided, especially upon the eye.

(4) Extirpation of Tumors.—A different proceeding is to be adopted in the case of malignant and of simple growths. In the former it may be necessary to remove a portion of skin by two semi-elliptical incisions, if it appears to participate in the diseased actions. But in extirpating wens or fatty or sarcomatous tumors however large, it is a general rule not to remove any of the skin, unless it is much inflamed or ulcerated, or so entirely adherent to the tumor that its separation would be very tedious and difficult. Again, in the former case it is necessary to cut quite wide of the diseased mass, and remove plenty of the surrounding tissues,—in the latter case the incisions should be carried through the cellular cyst of the tumor. In all cases it is a better plan (unless the

tumor is exceedingly large) to carry the dissection at once boldly to the deepest part where the largest vessels enter the tumor, than to tie the different branches as they are divided,—by which means some vessels may perhaps be tied more than once. Again, it is requisite in every case that the extirpation be complete, because if the smallest portion is left, it may become the nucleus of a fresh growth. If, therefore, it is found that there is any portion of a tumor which cannot be cut out without fear of dangerous hæmorrhage, a double ligature should be passed through its base, and be tied tightly on each side of it. The *entrance of air into a vein* is a most dangerous accident, that has sometimes occurred during the extirpation of tumors from the neck. A large vein being cut across, whose coats adhere to some firm textures around so that they cannot collapse, a sort of bubbling, sucking noise is suddenly heard, the patient instantly faints, and generally dies soon afterwards. On examination the heart is found distended with air. If any such sound should be perceived during an operation, the surgeon should instantly put his fingers on the spot that it proceeds from,—and the patient should be well supplied with stimulants.

CHAPTER II.

OF TREPHINING AND EXTIRPATION OF THE EYE, AND OF THE MINOR OPERATIONS GENERALLY.

I. TREPHINING.—In the first place, the bone, if not already laid bare by a scalp wound, must be exposed by a crucial or V incision, and the pericranium must be shaved off from the part which is to be perforated. The surgeon applies the trephine, and works it with an alternate pronation and supination of the wrist, and when it has made a circular groove deep enough to work in steadily, he takes care to withdraw the centre pin. He saws on slowly and cautiously, pausing frequently and examining the groove with a probe, to ascertain whether it has reached the dura mater, and when it has, he introduces the elevator to raise the circular piece of bone. He must be particularly careful to fix the centre pin, and the greater part of the circumference of the instrument on firm bone,—and by no means to press heavily, whilst sawing, on any piece that is loose or yielding. The saw will be known to have reached the diploe by the escape of blood with the bone-dust;—but it must be recollected that the diploe neither exists in children nor in the aged. The trephine should not be applied in the course of the sutures, nor

upon the lower part of the frontal or occipital bones, if it can be avoided.

II. EXTIRPATION OF THE EYE.—The operator first passes a ligature through the anterior part of the globe in order to steady it, and slits up the external commissure of the lids. Then he raises the upper eyelid, cuts through the fold of conjunctiva reflected from it to the eye, and dissects backwards, so as to separate all the soft parts from the roof of the orbit. The same process is repeated below and on the sides—taking care to cut close to the bone, and to remove the lachrymal gland. Then a curved knife is introduced on the outer side to cut through the optic nerve and origin of the muscles, and so the eye is detached. The patient must then be put to bed, with a cloth dipped in cold water laid over the face. If there is a very great hæmorrhage from the ophthalmic artery, it may be restrained by pressure with a piece of lint,—which should be removed as soon as it is suppressed; but the orbit must by no means be stuffed with that substance.

III. VENÆSECTION at the bend of the arm should always, if possible, be performed in the median-cephalic vein. A ligature being placed a little above the elbow, (but not tight enough to stop the pulse at the wrist,) the operator takes the forearm in his hand, places his thumb on the vein a little below the intended puncture, —and then (using the right hand for the right arm and *vice versâ*) pushes the lancet obliquely into the vein, and makes it cut its way directly outwards. When sufficient blood has been taken, the ligature is removed, the thumb placed on or just below the aperture to check the bleeding, and the wound is closed with a bit of lint and plaster, and secured by a small compress and figure of 8 bandage.

The jugular vein is sometimes opened in cases of apoplexy in adults, and in children if the veins at the elbow are hidden by fat. The thumb is placed on the vein a little above the clavicle, and an incision made in the ordinary way with a lancet, cutting obliquely upwards and outwards. The thumb is removed when enough blood is obtained, and the wound secured with lint and plaster. The veins in the leg, scrotum, or neighbourhood of the eye or ear; can readily be opened in the same manner instead of the ordinary venæsection, or leeching, or cupping.

Abscess in the cellular tissue, inflammation of the fascia, phlebitis, neuralgia, varicose aneurism, and aneurismal varix, are occasional ill consequences of venæsection.

IV. ARTERIOTOMY.—The temporal artery should be opened above the outer angle of the eyebrow—never just above the zygoma. The surgeon feels for the largest branch, steadies it with two fingers, one placed above, the other below the intended puncture—then pushes in the lancet in the same manner as in venæsection. The incision should be directed across the vessel, and should cut it about half through. When sufficient blood has flowed, the best plan is to introduce the lancet, and cut the vessel completely across,

so that its ends may retract. A firm graduated compress should then be applied, and be confined with a bandage passing round the head; and some degree of pressure should be kept up on the wound for a week or ten days. Any subsequent bleeding or spurious aneurism must be treated by completely dividing the artery, if it has not been done already, and by pressure,—but if the wound is much inflamed or ulcerated, so as not to admit of pressure, a transverse incision should be made on each side of it, and the artery be tied in both places.

V. CUPPING.—The patient being placed in a comfortable position, with towels arranged so that his clothes may not be soiled by the blood, and being moreover protected from cold, so that the flow of blood to the surface may not be checked, and the operator having his scarificator, glasses, torch, spirits of wine, lighted candle, hot water, and sponge, conveniently arranged on a table close by,—the first thing is to sponge the skin well with hot water, so as to make it somewhat vascular. The operator next dries it with a warm towel, and adapts his glasses to the part. Their number must depend on the quantity of blood to be taken—from three to five ounces is a fair calculation for each glass. In the next place, he dips the torch in the spirit, sets it on fire, introduces it for half a second into one of the glasses, and immediately claps the latter on the skin—and the same with the other glasses in succession. As soon as the skin has become red and swollen, he charges the scarificator, and takes it between his right forefinger and thumb, at the same time holding the lighted torch between the little and ring fingers of the same hand. He then detaches one glass by insinuating the nail of his left forefinger under its edge—instantly discharges the scarificator on the swollen skin, and as expeditiously as possible introduces the torch into the glass, and applies it again. The same process is repeated with the other glasses. When they become tolerably full, or the blood begins to coagulate in them, they must be detached in succession and re-applied, if blood enough has not been taken—and when the operation is finished, the wounds should be closed with lint and plaster. There are several points connected with this operation that require notice. In the first place, the glasses must not be exhausted too much; if they are, the pressure of their rims will occasion severe pain—the blood will not flow—and the operation will very probably be followed by a considerable ecchymosis. Secondly, the position of the glasses must be slightly varied each time they are applied, so that their edges may not again press on the same circle of skin. Thirdly, the expediency of not burning the patient needs scarcely be hinted at. Fourthly, in taking off the glasses, the upper part of each should be detached first, so that the blood may not escape. Lastly, the length of the scarificators must be adjusted to the thickness of the skin—if the incisions are too deep, the fat will protrude through them, and prevent the flow of blood. The

direction of the incisions should correspond to the course of the muscular fibres beneath; but this is of no great consequence. For *cupping on the temples* smaller glasses and scarificators are employed. A branch of the temporal artery is generally wounded, and the flow of blood may be expedited by slightly lifting the lower part of the rim of the glass. Pressure should be kept up on the wounds for some days afterwards, in order to prevent secondary hæmorrhage or false aneurism.

VI. ACUPUNCTURE is easily performed by running in a sufficient number of needles with a rotatory motion. Its utility is very problematical.

VII. ISSUES may be made by caustic or by incision. The former may be made either by rubbing a portion of skin of the requisite extent with the potassa fusa, or by making a paste with equal parts of the potass and soft soap, and laying it on the skin till the latter is converted into a black slough. The parts immediately around the issue should be protected with several layers of sticking-plaster. After the application of the caustic, the part should be poulticed till the slough separates, and then the sore may be prevented from healing, either by binding several peas firmly on its surface, or by touching it occasionally with the caustic. The other species of issue is made by pinching up the skin, and slitting it up with a lancet, and then introducing some peas to prevent it from healing.

VIII. SETONS are introduced by pinching up a fold of the skin, and pushing a needle through it armed with a skein of silk or cotton, or a long flat piece of Indian-rubber. As soon as one or two inches of the thread are brought through, the needle is cut off. A fresh portion of the thread is to be pulled through the wound every day, so as to keep up a constant irritation and discharge. If the discharge is insufficient, the thread may be covered with some irritating ointment before it is drawn under the skin.

IX. THE MOXA is a peculiar method of counter-irritation long practised in the East, and occasionally employed in Europe, for the relief of chronic nervous and rheumatic pains, or for chronic diseases of the joints. One or more small cones, formed of the fine fibres of the artemisia chinensis, or of some other porous vegetable substance—such as German tinder, or linen impregnated with nitre, are placed on the skin over the affected part, then set on fire, and allowed to burn away so as to form a superficial eschar. The surrounding skin must be protected by a piece of wet rag, with a hole in it for the moxa. It is convenient sometimes to use the moxa as a rubefacient or vesicant. A roll of German tinder ignited may be held with dressing forceps at a little distance from the skin, the surgeon at the same time blowing upon it with a blow-pipe, till the skin become red.

X. VACCINATION.—The success of this operation will depend partly on the state of health of the patient—for it will most pro-

bably be defeated if there is any cutaneous disease or disorder of the system generally—and partly on the quality of the matter which is inoculated. The matter should be taken before the eighth day, before an inflamed areola is spread around the vesicle, and it should be *lymph*, clear and transparent, not purulent. The operator should make three punctures in each arm with a fine lancet, carrying the point of the instrument obliquely under the cuticle for about $\frac{1}{16}$th of an inch, and, if possible, without drawing blood. Then, if he has a patient to take the matter from, he ruptures a portion of the vesicle, dips the lancet in the lymph, and inserts it into each puncture. If he has the matter on *points*, he should breathe on them so as to liquefy it, and then insert one into each puncture, and allow it to remain three or four minutes.

XI. BANDAGING.—The art of bandaging is not to be learned from books. Nor is it worth while to dwell upon the almost innumerable kinds of bandage that are described in the older systems of surgery. The suspensory or T bandage—the three-tailed, the four-tailed, and many-tailed—the single and double-headed, the retentive, expulsive, and uniting bandages,—many of them have fallen into oblivion, and the use and application of the others is readily acquired in a few months attendance on hospital practice. The general rules to be observed in bandaging a limb are, to begin at the extremity, and apply the bandage most tightly there, and more loosely by degrees as it ascends—to make each successive fold overlap about one third of the preceding—to keep the bandage close to the limb, and unrol very little of it at a time—and to double it on itself on parts (such as the calf of the leg) where it would not lie smoothly otherwise.

CHAPTER III.

OF THE LIGATURE OF ARTERIES.

I. THE COMMON CAROTID artery may be tied below the omo-hyoideus muscle in the following manner. The patient being placed in a recumbent position, with the head thrown back and slightly turned towards the opposite side, an incision three inches in length is made along the inner margin of the sterno-mastoid muscle. It should be carried through skin, platysma, and superficial fascia, and should terminate about an inch above the sternum. The edge of the sterno-mastoid is now to be drawn out-

wards, (the head being brought a little forward so as to relax it,) and the cellular tissue lying over the deep fascia is to be raised with forceps and divided, turning aside any veins that may be found. The thin strong deep fascia is next to be divided, beginning below the margin of the omo-hyoideus to which it adheres. It should be slightly raised with the forceps, and be divided immediately over the artery (the situation of which is to be first carefully ascertained with the finger) by cautious touches with the knife, the flat surface of which should be held towards the vessel. Then about half an inch of the sheath is to be opened in the same manner—avoiding the descendens noni nerve. It should be opened rather to the inner side of the artery, so that the jugular vein may not be interfered with. Then an aneurism needle, armed with a single ligature, is to be carried round the vessel. It is to be passed from the outer side, and to be kept close to the vessel, within its sheath. When its point appears on the inner side, the surgeon seizes the ligature with forceps, and withdraws the needle—ascertains that the nervus vagus is not included in the

ligature—and then ties it tightly in the double knot represented at page 39. One end of the ligature may then be cut off close to the knot, and the other be left hanging out of the wound, which is to be closed with plaster when bleeding has ceased. The patient must be kept at perfect rest in bed till the ligature separates.

This artery may be tied above the omo-hyoideus, by making an incision through the skin and platysma three inches in length, and terminating at the level of the cricoid cartilage. The fascia should next be divided on a director, in the same manner as the layers over a hernial sac, (p. 342.) The surgeon then separates the cellular tissue and veins from the sheath, and opens the sheath and passes the ligature in the manner described above.

II. The External Carotid may sometimes require a ligature, if many of its branches are wounded *and cannot be tied.* An incision of the same length and direction as in the two preceding operations should be made through the skin, platysma, and sheath, so as to tie the vessel near its origin, that is at the level of the os-hyoides, and below the part where it is crossed by the digastric muscle and ninth nerve.

III. The Lingual Artery may be tied, by making a transverse incision along the os-hyoides from a little below the symphysis of the jaw to near the border of the sterno-mastoid. The skin, platysma, and fascia being divided, the artery must be looked for where it lies upon the greater cornu of the os-hyoides, below the digastric muscle and ninth nerve. This artery has been tied in cases of tumors and wounds of the tongue; but considering the depth at which it lies from the surface, the irregularity of its origin, and the important parts in its vicinity, it is much better, as a general rule, to tie the external or common carotid.

IV. The Facial Artery may easily be tied by cutting through the skin and cellular tissue that cover it where it turns over the jaw, at the anterior border of the masseter; but such an operation can hardly ever be requisite.

V. The Arteria Innominata may be tied in cases of aneurism of the right subclavian, extending inwards as far as the scalenus. The patient being placed on his back, with the shoulders raised and head thrown back, one incision, two inches in length, is to be made along the inner margin of the sterno-mastoid muscle, terminating at the clavicle—and another across the origin of that muscle, meeting the former at a right angle. The flap of integument thus formed is to be turned up, and the sternal and part of the clavicular origin of the sterno-mastoid are to be divided on a director, which is to be passed behind the muscle and kept as close to it as possible. The cellular tissue and fat which now appear, being turned aside, the sterno-hyoideus and sterno-thyroideus muscles must be separately divided on a director. A strong fascia which next appears, must be cautiously scratched through, and the carotid be traced with the finger down to its origin. Then the vena inno-

minata being depressed, a ligature may be carried from without inwards, round the artery, close to its bifurcation, taking care to avoid the vagus, recurrent, and cardiac nerves.

VI. THE SUBCLAVIAN ARTERY of either side may be tied external to the scalenus muscle. The patient may be laid on a table, with the shoulder of the affected side drawn down as far as possible, and the head slightly turned to the other side. An incision must then be made through the skin and platysma from the margin of the sterno-mastoid to that of the trapezius. This preliminary incision may be conveniently made by drawing down the skin, and cutting through it whilst it is steadied on the clavicle. The superficial fascia must next be divided to the same extent, taking care not to wound the external jugular vein. The succeeding steps of the operation consist in cutting cautiously through the cellular tissue and fascia down to the outer edge of the scalenus muscle. Many surgeons tear through them with a director or blunt silver knife. The point of the finger must next be passed along the scalenus down to the rib—and in the angle between that muscle and the rib, the artery will be found. The needle must be passed round it from below upwards. If there is much difficulty with the common needle, that invented by Dr. Mott, with a contrivance for separating the point, and bringing it and the ligature round on the other side of the vessel, may be used instead.

VII. THE AXILLARY ARTERY may be tied below the clavicle, by making a semilunar incision from near the sternal end of the clavicle to the anterior margin of the deltoid. The skin, superficial fascia, and clavicular fibres of the pectoralis major muscle, are to be divided in succession—avoiding the cephalic vein and thoracica-acromialis artery, where they pass between the pectoralis and deltoid. The flap being turned down, a strong fascia which intervenes between the pectoralis minor and subclavian muscles is next to be divided on a director, the cellular tissue and veins covering the vessels to be turned aside;—then the axillary vein being pressed downwards, a ligature is carried round the artery from below upwards. This operation is exceedingly difficult, and only to be performed in case of wounds.

It is much more easy to tie this artery in the axilla. The arm being widely separated from the trunk, and the forearm supinated, an incision two inches in length is made over the head of the humerus, between the margins of the pectoralis major and deltoid, but rather near the latter. The cellular tissue must be dissected through, the vein and nerves drawn aside, and the aneurism needle passed from the inner side.

VIII. THE BRACHIAL ARTERY is superficial in the whole of its course, and may be tied by making an incision two inches in length on the inner border of the coraco-brachialis in the upper part, and of the biceps in the lower part of the limb. The incisions must be directed towards the centre of the limb—and the

cellular tissue must be divided with caution, so as not to injure the internal cutaneous nerve, which lies superficial to the artery in the upper part of its course. At the lower part of the limb, the basilic vein must be avoided. It must be recollected that the median nerve lies over the artery in the middle of its course—and that the vessel has two venæ comites, both of which must be carefully excluded from the ligature. Before tying the ligature, it should be ascertained whether or not there is a *high division* of the artery, and whether the trunk that is exposed commands the circulation at the wounded or aneurismal part.

In the case of a small puncture of this artery at the bend of the elbow, from carelessness in bleeding, the surgeon may either close the wound, and attempt the cure by compression—placing a graduated compress on the wound—bandaging the whole limb—and using measures for reducing the circulation—or may at once enlarge the wound upwards and downwards to the extent of three inches—divide the fascia to the same extent, and tie the vessel above and below the wound—recollecting that the median nerve lies to its inner side. There are authorities for both practices. Supposing an aneurism to follow such an accident, it is better to cut into the tumor and tie the vessel above and below it, than to trust to one ligature at the lower part of the arm.

IX. The Radial Artery in the upper third of the fore-arm may be tied by making an incision three inches in length, in a line from the bend of the elbow to the thumb, through the skin and superficial fascia, avoiding the veins. The supinator longus and pronator teres being drawn asunder, and the deep fascia being divided to the same extent, the artery will be exposed, with its accompanying veins, which are to be carefully separated before the ligature is passed. The aneurism needle should be introduced from without, in order to avoid the radial nerve, which lies at a distance on the radial side.

This vessel can be readily tied in its middle third by making a similar incision through the same parts on the ulnar border of the supinator longus—and in the lower third, on the radial side of the flexor carpi radialis. It may also be tied at the back of the carpus, just before it dips into the palm, between the first and second metacarpal bones, by making an incision on the radial edge of the tendon of the exterior secundi internodii pollicis.

X. Ulnar Artery.—When this vessel is wounded in its upper third, where it is covered deeply by muscles, it is an undecided point whether the wound should be dilated—cutting through or across the muscles to reach the bleeding point,—or whether the lower end of the brachial should be tied. In the middle and inferior thirds of the forearm, this vessel may be readily exposed by cutting through the integuments and superficial fascia along the outer margin of the flexor carpi ulnaris for the extent of three inches. That muscle is then to be drawn inwards, the deep fascia

divided, the veins separated from the artery, and the needle to be passed from within, so as to avoid the ulnar nerve which lies on the ulnar side.

In wounds of the palm, with great hæmorrhage, the wound should be dilated and the bleeding vessels be tied, unless they lie too deeply. If that is the case, methodical pressure should be resorted to—the wound being cleared of coagula, and filled with lint, (which may or may not be dipped in oil of turpentine,) and firm pressure being made upon it, before and behind, in the manner described at p. 243. But if hæmorrhage has recurred again and again, and the parts are inflamed or infiltrated with blood, the brachial artery should be tied just above the elbow.

XI. The Aorta, the Common Iliac, and the Internal Iliac arteries, may be tied by a similar operation. An incision from four to six inches in length must be made on the anterior surface of the abdomen. It may either be made parallel to the outer border of the rectus, or to the epigastric artery—and it should terminate an inch above Poupart's ligament. The three layers of abdominal muscles are to be cautiously divided to the same extent—and the fascia transversalis likewise—it being first scratched through, so that the finger may be introduced between it and the peritonæum—to divide it upon. The peritonæum must now be detached by the fingers from the iliac fossa, as far as the brim of the pelvis, where the external iliac will be found beating—and by following this vessel upwards, the operator will come upon the internal or common iliac, or the aorta. The edges of the wound being now held asunder by copper spatulæ, the artery to be tied must be separated from its vein with the nail of the forefinger or the flat end of a probe, and the aneurism-needle be passed round between it and the vein. It will be recollected that the common iliac veins lie behind and to the right of their respective arteries—that the left internal iliac vein is behind its artery—and that the right is a little external as well as posterior. The internal iliac may require to be tied for disease or injury of the glutæal or other branches outside the pelvis.

XII. The External Iliac artery my be tied, according to Sir A. Cooper's method, by making a semi-lunar incision (with the convexity looking downwards and outwards) from near the anterior superior spinous process of the ilium to the superior angle of the external abdominal ring. The skin, superficial fascia, and tendon of the external oblique having been divided, the lower margin of the internal oblique and transversalis muscles must be raised on the finger and detached from Poupart's ligament,—and then if the finger is passed back under the spermatic cord, it will come in contact with the artery. The dense cellular tissue connecting the artery with the vein (which lies on its internal and posterior aspect) must be scratched through, and the needle be passed between them.

XIII. The Femoral artery may be tied in any part of its course from Poupart's ligament downwards,—but the best spot for the ligature, when performed for popliteal aneurism, is just above the part where the vessel is overlapped by the sartorius—some little distance below the origin of the profunda. The patient being placed on his back, with the leg turned outwards, an incision must be made through the skin in the course of the vessel, which corresponds to a line drawn from the middle of Poupart's ligament to the inner edge of the patella. The incision may commence two inches below the groin, but its length must depend on the thickness of the parts to be divided. It is better to make it too long than too short. The cellular tissue must next be dissected down to the fascia lata—avoiding the saphenic vein. If any glands are in the way, they should be turned aside. The fascia lata is now to be divided for about two inches, and the sartorius to be gently drawn outwards. The artery may now be felt, and when the sheath and the cellular tissue over it have been raised with the forceps and divided by cautious touches with the knife, (held with its flat surface towards the artery,)—the point of the aneurism needle is to be gently insinuated between the artery and the vein (which lies behind it.) The needle should be passed from the inner side. Before finally tightening the ligature, the artery should be compressed, to see whether the pulsation in the aneurism ceases, in case of any irregularity in the course and distribution of the vessel.

The Femoral artery may be tied in the middle third of the thigh, where it is covered by the sartorius, by cutting on the inner edge of that muscle and turning it aside, and then slitting up the strong fibrous sheath which envelopes the artery at that part; but it is a much more difficult operation, and has no commensurate advantages.

XIV. The Glutæal artery may be tied by placing the patient on his face, with the toes turned inwards, and making an incision from an inch below the posterior spinous process of the ilium, and an inch from the sacrum, towards the great trochanter, for the extent of four inches. The fibres of the glutæus maximus having been cut through or separated to the like extent, and a strong fascia beneath having been cut through, the vessel will be found emerging from the upper part of the sciatic notch. The Sciatic artery may be found by making an incision through the same parts and for the same extent, but an inch and a half lower down. Both these operations are extremely difficult, from the great depth to which the dissection must be carried, the unyielding nature of the surrounding parts, and the hæmorrhage from the numerous blood-vessels that must necessarily be wounded. They should be attempted, however, in case of wounds—but for aneurisms of these arteries, it is necessary to tie the internal or common iliac.

XV. The Poplitæal artery may be tied by cutting through the skin and fascia lata for the extent of three inches on the outer

border of the tendon of the semi-membranosus—the patient being placed on his face, with his knee straight. On pressing that tendon inwards, the artery may be felt. Its vein, which lies superficial and rather external to it, must be cautiously separated and drawn outwards, and the needle be passed between them.

XVI. Posterior Tibial Artery.—The operation usually recommended for tying this artery in the upper part of the leg is performed thus. The limb being placed on its outer side, with the

knee bent and the foot extended, an incision four inches in length must be made through the skin and fascia over the inner margin of the tibia, avoiding the saphena vein. The edge of the gastrocnemius thus exposed is to be turned back. A director must then be insinuated beneath the inner head of the solæus, on which this muscle must be divided from its attachment to the tibia. The strong and tense fascia beneath it must next be divided in the same manner. Then the muscles being relaxed as much as pos-

sible by bending the knee and extending the foot, the artery may be felt about an inch from the edge of the tibia. The veins are to be separated from it, and an aneurism-needle passed round it from without, inwards, so as to avoid the nerve.

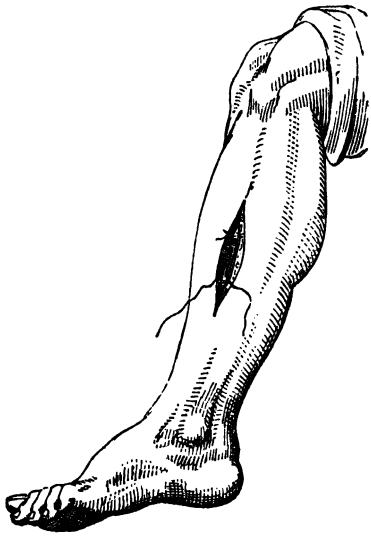
This operation, however, is considered by Mr. Guthrie to be so "painful, difficult, bloody, tedious, and dangerous," that he proposes to reach the artery by making a perpendicular incision six or seven inches in length, at the back of the leg, through the skin, gastrocnemius, plantaris, and solæus—then the fascia will be exposed with the artery beneath it, and the nerve to the outer side.

The posterior tibial artery may be easily exposed, in the lower third of the leg, by cutting through the skin and two layers of fascia parallel to the tendo Achillis, and on its inner side, for the extent of two or three inches. The cellular tissue and sheath must be cautiously divided, the venæ comites separated, and the needle passed round the vessel from the outer side. This artery may also be tied behind the inner ankle. A semilunar incision, two or three inches long, is made in the hollow between the heel and the ankle, but rather nearer to the latter. The integuments, the superficial fascia, and a very strong tendinous aponeurosis, continuous with the deep fascia of the leg, must be successively divided to the same extent. The sheath of the vessels which will be thus exposed must be opened—the venæ comites separated, and the needle passed from the heel towards the ankle in order to avoid the nerve.

XVII. The Peronæal artery may be exposed in the upper part of the leg by an incision similar to that which Mr. Guthrie proposes for the ligature of the posterior tibial, only rather more external. For the first few inches of its course, this vessel lies underneath the deep fascia—afterwards it lies concealed under the inner edge of the flexor longus pollicis, which must be turned aside to expose it.

XVIII. The Anterior Tibial artery in the first third of its course, where it is covered by the extensor muscles, is very difficult to reach. If, however, it is expedient to place a ligature on it, an incision four or five inches in length must be made down to the fascia, in the direction of a line drawn from the head of the fibula to the base of the great toe. The intermuscular septum, between the tibialis anticus and extensor digitorum muscles must then be cut into, and the muscles be separated down to the interosseous ligament, where the artery will be found. The foot should be moved backwards and forwards at the ankle, in order to ascertain with exactness the junction of those muscles.

Below the middle of the leg, at any point to its termination, this artery may be found on the fibular side of the extensor proprius pollicis tendon, which must be the guide for the incision. The coverings must be divided with the usual precautions, and



neither the peronæal nerve nor the venæ comites should be wounded with the knife, or included in the ligature.

In wounds of the arteries in the sole of the foot, (except perhaps of the external plantar, opposite the base of the little toe,) it is scarcely judicious to enlarge the wound with the view of securing the bleeding point—but if pressure fails, the posterior tibial should be tied behind the inner ankle—and the anterior tibial on the dorsum of the foot likewise, if necessary.

It may be observed in conclusion, that in all cases of wounded arteries, where it is practicable, the bleeding point should be exposed, and a ligature be placed both above and below it. If the wound in the superjacent parts is direct, it may be enlarged, if necessary, in the proper direction and to the requisite extent. If, however, the wound pass indirectly, (from the back of the thigh, for instance, to the femoral artery,) the part of the vessel supposed to be wounded should be cut down upon in the ordinary way. In both cases the introduction of a probe will be a useful guide to the seat of injury. If the wounded part of the artery cannot be

tied, pressure on the wound with a graduated compress, and on the trunk of the vessel above, and on the whole limb by means of proper compresses and bandages, is the next resource—which failing, the vessel must be tied at the nearest practicable point above the wound—and perhaps below it also—in order to prevent regurgitation.

CHAPTER IV.

OF LITHOTRITY AND LITHOTOMY.

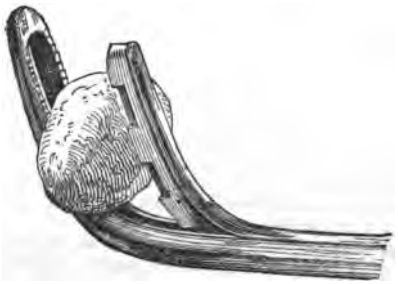
I. LITHOTRITY.—It need scarcely be said, that the object of this operation is to reduce stones in the bladder into fragments of so small a size, that they may be readily expelled through the urethra.

The apparatus by which this object was first accomplished by Civiale and Leroy was, as Sir C. Bell rightly called it, villanous and dangerous enough. A straight cylindrical canula was introduced into the bladder, containing three or four branches which could be protruded from its extremity. These were made to grasp the stone and hold it tightly, whilst it was bored, and scooped, and excavated by drills and other contrivances contained in the centre of the canula, and worked by a bow. When the stone was sufficiently excavated, its shell was crushed by a most complex piece of mechanism called the *brise coque*, or shell-breaker. "For some time," says Mr. Liston, "it was maintained, that almost every case of stone could be satisfactorily disposed of by this boring and grinding process. It was tried extensively," but, "after many miserable and painful failures, utterly disappointed the hopes of its advocates." Nor will these failures be wondered at, when we consider the difficulty sometimes of seizing the stone, sometimes of disentangling the instrument from it—the extremely slow and inefficient means of disintegrating it, and the great number of times the operation was consequently obliged to be repeated;—not to mention the pain caused by the stretching of the urethra with a large straight instrument—the risk of entangling the coats of the bladder, and of seriously bruising the parts about its neck—and the most incomprehensible perplexity of the instruments employed—the nomenclature, structure, and uses of which required not a little study.

The next method which was employed, and which was first practised by Heurteloup, consisted in hammering the stone to

pieces. The patient was strapped down to the *lit rectangulaire*, (a bed of peculiar construction, with contrivances that enable the surgeon to turn him almost heels over head,) and the *percuteur courbe à marteau*—an instrument composed, like the urethral forceps, of two blades sliding on each other, was made to seize the stone. It was then broken by repeated blows with a hammer on the other extremity of the instrument, which was fixed securely to a vice, so that the percussion could by no possibility be communicated to the bladder. But this plan was fraught with many inconveniences. The instrument was liable to be bent or broken; or its blades to be so clogged with pulverised fragments, that they were withdrawn with difficulty; or perhaps not until the orifice of the urethra had been slit up.

The instrument which has now superseded the foregoing, is the *screw lithotrite* of Mr. Weiss. It is composed of two sliding blades, between which the stone is seized, and then is crushed by gradual pressure with a screw. And to prevent any clogging of the



blades by the lodgment of fragments, the anterior blade is made open to receive the other within it. The operation is performed as follows. The patient is placed on a couch with his pelvis well raised, and his shoulders comfortably supported;—the bladder is then emptied, and five or six ounces of tepid water injected with a proper catheter and syringe. The instrument, previously warmed and oiled, is introduced and placed upon the stone—its blades are opened and made to grasp it between them—the handle is moved from side to side, to ascertain that no part of the bladder is entangled—and then it is depressed so as to lift the stone towards the neck of the bladder. The screw is then slowly and cautiously turned backwards and forwards till the stone is crushed by its repeated impulses. The next thing is to seize and comminute the

fragments either with the same instrument, or with one that has not the aperture in the anterior blade. Sometimes they may be removed with sundry scoops. But whether this can be done at one sitting or at many, must depend on the size of the stone, and the degree of inconvenience suffered by the patient.

No fair numerical estimate can yet be made of the proportion of cases in which lithotrity has been successful or otherwise. In its present improved form, and practised on patients calculated for it, it may be considered easy, safe, and effectual. But practised indiscriminately as it formerly was, the mortality was frightful—equal, as Dr. Willis says, to that of a pestilence—certainly one in four, but much more probably one in two. Of twelve cases narrated by Mr. Key, three were cured by it—in three it was either inapplicable or unavailing, and lithotomy was resorted to—and the remaining six perished—one with abscess in the prostate soon after the operation—four with protracted sufferings from irritation of the bladder by the fragments which were retained—and one with disease of the bladder brought on or aggravated by the operation. The chief danger arises from the substitution of many irregular fragments for one smooth stone. The proper preparation, therefore, consists in the use of low diet, demulcents, and alkalis, (if not contra-indicated,) to diminish the irritability of the bladder. The after treatment comprises the same measures—together with diluents to increase the secretion of urine, and injections of warm water to accelerate the passage of the fragments—and hip-baths, opiates and leeches, or cupping on the perinæum, for the relief of pain or inflammation. Sometimes the fragments stick in the urethra, and require to be removed by incision in the perinæum; and sometimes it is requisite, after all, to extract them from the bladder by a regular lithotomy operation.

II. Lithotomy.—This operation must be resorted to in those cases which it would be improper to submit to lithotrity—those, namely, in which the stone is very large or very hard—or when there are more than one, or when the urethra is diseased, or the prostate enlarged—or the coats of the bladder diseased—or the stone adherent, or contained in pouches or sacculi of the bladder—or the patient very old or very young.

The surgeon must, however, in the first place, ascertain that the patient is free from serious organic disease—which would render him liable to sink under the operation. Languor, depression, loss of strength, and flesh, and appetite, irregular shiverings, pain and tenderness in the loins, purulent or highly albuminous or bloody urine, indicating organic disease of the kidneys; — excessively frequent and painful micturition, with the urine constantly bloody and purulent, indicating serious organic disease or ulceration of the prostate or bladder—the existence of pulmonary consumption, or of any other extensive disease, require the surgeon to decline the operation—or at least to perform it only at the urgent and re-

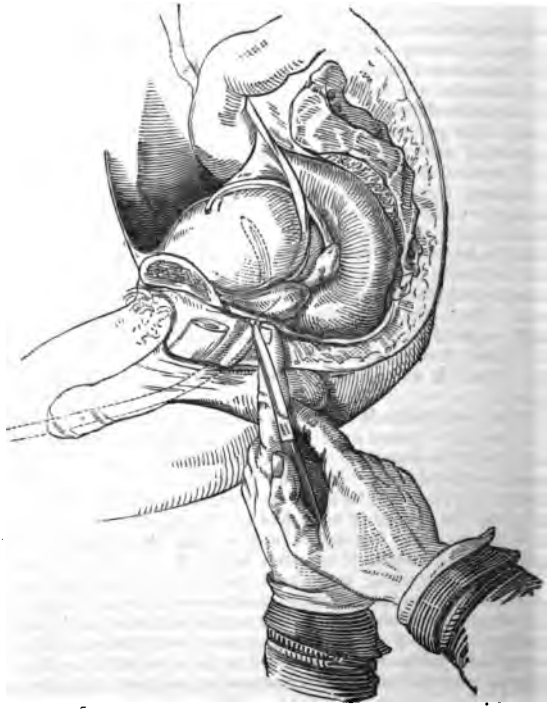
peated request of the patient, who should be informed of its probable result. In the second place, the patient must be well prepared by measures calculated to improve the general health, and to remove all disorder of the urine and irritability or congestion of the bladder. He should not even be sounded whilst labouring under any local or general vascular excitement.

There are four methods in which lithotomy may be performed, viz. the lateral operation in the perinæum—the bilateral—the recto-vesical—and the high operation. The lateral is that which common consent has decided to be the best, except in a few rare instances. There are sundry varieties in the manner of performing it, and in the instruments employed by different surgeons. The author will first describe the method recommended by Mr. Liston, not only on account of its simplicity, but because he is enabled, by the kindness of his publishers, to make use of the same admirable wood engraving which illustrates the subject in Mr. Liston's recent work on Practical Surgery.

Lateral Operation.—It is advisable that the bowels should be cleared on the morning of the operation with a simple enema. The bladder should be moderately full, and if the patient has recently emptied it, a few ounces of water may be injected. It is also desirable that the existence of the stone should be clearly demonstrated with the sound or staff, immediately before the operation. Then the proceedings may commence by introducing the *staff*—a solid steel rod like a sound, with a deep groove either on its convex border, or, as some surgeons prefer it, a little on its left side. It should be as large as can be conveniently introduced.

The next point is to fix the patient in a convenient posture. He should be placed on his back, on a table two feet and a half high, with his shoulders resting in the lap of an assistant, who sits astride behind him. Then, in order to expose the perinæum thoroughly, he must be made to raise and separate his thighs, and to grasp the outside of each foot with the hand of the same side; and the hand and foot are to be firmly bound together by a broad garter;—meanwhile, if not done before, the perinæum should be shaved. Everything being now prepared, an assistant on each side holding the thighs firmly asunder—another at hand to give the surgeon his instruments—and a third stationed on the left side holding the staff perpendicularly, and well hooked against the symphisis pubis—in which position he is to hold steadily from first to last: the surgeon commences by passing in his knife to the depth of an inch on the left side of the raphe, about an inch before the anus, and cutting downwards and outwards to the bottom of the perinæum, midway between the anus and tuberosity of the ischium. "The forefinger of the left hand," says Mr. Liston, "is then placed in the bottom of the wound about its middle, and directed upwards and forwards; any fibres of the transverse mus-

cle, or of the levator of the anus, that offer resistance, are divided by the knife, its edge turned downwards;—the finger passes readily through the loose cellular tissue, but is resisted by the deep fascia, immediately anterior to which, the groove of the staff can be felt not thickly covered. The point of the instrument is slipped along the nail of the finger, and, guided by it, is entered,



the back still directed upwards into the groove at this point. The finger all along is placed so as to depress and protect as much as possible the coats of the rectum, and the same knife, pushed for-

wards, is made to divide the deep fascia, the muscular fibres within its layers, a very small portion—not more than two lines—of the urethra anterior to the apex of the prostate, together with the prostatic portion of the canal and the gland to a very limited extent." The direction of this incision through the prostate should be downwards and outwards—corresponding of course to that of the whole wound—and its extent should not be greater than seven lines. The next thing is to withdraw the knife, and pass the finger along the staff into the bladder, to ascertain the position and size of the stone. If the patient is young and thin, the forceps may now be at once introduced; but if he is an adult, and especially if the prostate is large and rigid, it will be proper to use the *blunt gorget* previously, in order to dilate the aperture in the gland. The surgeon takes it in his right hand, with the concave surface uppermost, places its *beak* in the groove of the staff, and pushes it gently into the bladder. Then the staff being removed, a forceps suited to the size of the stone is to be very gently introduced into the bladder. If the gorget was used, it may be passed along its concave surface before it is withdrawn. It must be introduced closed, and brought into contact with the stone—then the blades are opened over it and made to grasp it;—if the stone is seized awkwardly, it is relinquished and seized again—then it is extracted by slow, cautious, undulating movements.

The general maxims to be borne in mind during the performance of this operation are, (1) to make a free external aperture, and to bring it low enough down, so that the urine may subsequently escape freely without infiltrating the cellular tissue; (2) not to cut too high up, or to open the urethra too much in front, for fear of wounding the bulb or its artery; (3) not to wound the rectum, or pudic artery, by carrying the incisions too much inwards or outwards; (4) and above all, not to cut *completely through* the prostate, nor to wound its fibrous envelope, otherwise the urine will find a ready passage into the loose cellular tissue of the pelvis, and the patient will almost surely die.

The varieties of this operation before alluded to are as follows. Most surgeons direct the assistant to hold the staff so that it may project in the perinæum, and incline a little to the left side of it,—and when they have opened the urethra, and are about to incise the neck of the bladder, they take its handle in their own left hand, and bring it down horizontally. Some surgeons use a straight staff; but it renders the artery of the bulb more likely to be wounded. Again, there are great diversities in the manner of cutting into the bladder. Many use a *beaked knife*; some a *bistouri caché*, an instrument containing a blade that protrudes to a certain extent on touching a spring—and not a few use the *cutting gorget*; the beak of which being put into the groove of the staff, held horizontally in the operator's left hand, it is pushed cautiously on, and made to cut its way into the bladder. If this instrument is em-

ployed, every precaution must be used to keep it in contact with the staff, and not to let it slip between the bladder and rectum,—an accident that has been the death of not a few. In the case of a very large stone, it will be expedient to divide both sides of the prostate. This may be done, either by cutting into the bladder with a double-edged beaked knife—or after one side is incised in the ordinary way, by cutting through a little of the other with a probe-pointed bistoury, the edge of which should be directed towards the right *tuber ischii*.

After Treatment.—When every fragment of the stone has been removed, and the bladder has been syringed with warm water, the patient should be put to bed on his back with his shoulders elevated, and a napkin applied to the perinæum to soak up the urine. It is a good plan to introduce a large gum elastic canula through the wound into the bladder, for it to flow through. If not, the surgeon should introduce his finger after a few hours, to clear the wound of coagula. Pain must be allayed by anodynes — the bowels be kept open without purging—the wound be kept perfectly clean, and then, in favourable cases, the urine begins to flow by the urethra in about a week, and the wound heals completely in four or five.

Complications.—(1) Severe hæmorrhage may proceed from the pudic or bulbous arteries if wounded. If the bleeding orifice cannot be secured, it must be compressed as long as may be necessary with the finger. A general venous or arterial oozing must be checked by filling the wound firmly with lint or sponge—the tube being then indispensable. (2) Tenderness of the belly and other inflammatory symptoms must be combated by leeches, fomentations, and, if necessary, venæsection. (3) Chronic inflammation of the bladder, with continued secretion of the phosphates, by the measures directed at p. 362. (4) Sloughing of the cellular tissue from urinous infiltration is indicated by heat of the skin and sleeplessness, followed by a rapid, jerking, intermittent pulse—hiccup,—the belly tympanitic, the countenance anxious, and the other signs of irritative or typhoid fever. To be treated by wine, bark, and ammonia, and by laying the wound into the rectum.

The *Bilateral Operation* is performed by making a curved incision with the convexity upwards, from one side of the perinæum to the other—carrying it between the anus and bulb, opening the membranous portion of the urethra—and then pushing a double bladed *bistouri caché* into the bladder, by which both sides of the prostate may be divided.

The *Recto-vesical Operation* consists in cutting into the bladder from the rectum in the middle line behind the prostate.

The *High Operation* is performed by making an incision through the linea alba, and opening the bladder, (which is projected upwards on the point of a catheter,) at its fore and upper part, where it is uncovered by peritonæum. This operation may be occasion-

ally resorted to when the stone is of great size, and the prostate enlarged, or the space between the ischia preternaturally contracted.

CHAPTER V.

OF THE AMPUTATIONS.

I. AMPUTATION OF THE THIGH being one of the most important and most frequently demanded, may be described first. The patient should be placed with the diseased leg projecting over the edge of the bed or operating table, and the knee supported by an assistant sitting in front. The sound limb may be secured to one of the legs of the table. Then measures must be taken for moderating the flow of blood during the incisions. This may be effected in two ways—by the tourniquet, or by pressure with the hands. The advantage of the tourniquet is, that it compresses the smaller arteries as well as the principal trunk—its disadvantage is, that it arrests the venous circulation, and produces an accumulation of blood in the limb below, and a greater loss of it in consequence. If, therefore, it is used, it should not be constricted tightly until the incisions are just commencing. The tourniquet consists of three parts—a pad to compress the main artery, which should be firm, narrow, and flattish—a strong band which is buckled round the limb—and a bridge-like contrivance, over which the band passes, with a screw, by turning which the bridge is raised and the band tightened. One or two turns of a common bandage should be applied first, in order to protect the skin, and the pad should be placed so as to compress the artery against the bone. If the amputation is high up, there is no choice—the femoral artery must be compressed by a steady experienced assistant against the pubes.

This, like other amputations, may be performed in two ways—either by the *circular incision* — cutting round the limb from without towards the bone; or by the *flap operation*—transfixing the limb, and then cutting outwards. The latter is the more fashionable at present. It certainly can be performed with greater celerity, and is said to give less pain. It should be preferred when the skin is adherent to the parts beneath, so as to be retracted with difficulty—and when the flesh on one side of the limb is destroyed by disease or injury;—for, in this latter case, the end of the stump may be covered with a flap taken almost entirely from the sound side, and a much greater length of the limb may be saved. Sir C. Bell ob-

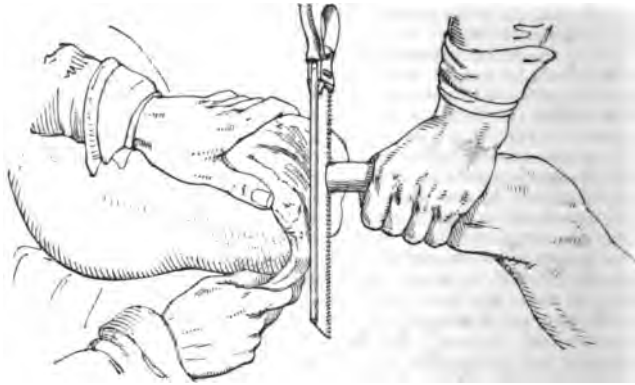
jects to it, because the nerves, being of a firm texture, are liable to be stretched out and cut longer than the surrounding parts—thus laying the foundation for subsequent neuralgic affections. The grand rule in all cases is, as Sir C. Bell observes, to save integument enough to cover the muscle, and muscle enough to cover the bone, and not to scrape off the periosteum. If these things are done, it requires ingenuity to make a bad stump. It is ordinarily stated that this amputation should be performed as low down as possible—(never, however, within two inches of the patella, so as to cut into the joint)—but Mr. Liston affirms, that the thigh bone should never be sawn lower than its middle, because there are certain difficulties in fitting an artificial limb to a long stump.

(1.) *Circular Method.*—The surgeon stands on the outer side for the left leg, and on the inner for the right; so that he may steady the limb with his left hand. Then the artery being compressed by one of the methods before described, and an assistant grasping the limb with both hands. so as to draw up the skin as high as possible, the surgeon, putting his arm under the thigh, makes an incision at one sweep completely round the limb, through the skin and fat down to the fascia. The assistant is now to draw the skin further up, the retraction being aided by a few touches with the knife; and then the knife, being put close to the edge of the retracted skin, is to be made divide everything down to the bone by another clean circular sweep. The next thing is, to separate the muscles from the bone for another inch or two with the point of the knife, especially those connected with the *linea aspera*; and then the periosteum, being divided by one more sweep—the *retractor*, a piece of linen, with a longitudinal slit in it, is put over the face of the stump, the muscles are to be drawn up, and the bone sawn through. The saw is to be used very lightly, and the last few strokes should be excessively short and gentle, that the bone may not be splintered. If it is, the irregular part must be removed with nippers. The femoral artery should now be tied, its orifice being seized and slightly drawn out by forceps, and afterwards any other large branches that appear in the muscular interstices. Then all compression should be *suddenly ceased*, so that any arteries that are likely to bleed may do so, and be tied at once. Hæmorrhage from large veins is to be restrained by elevating the stump, and making compression for a short time with the finger. If, however, nothing else will do, they must be tied. Any obstinate oozing from small vessels should be restrained by sponging with cold water, or perhaps by a touch with arg. nitras. Then a light bandage may be passed round the limb above the stump, and the patient be removed to bed, the stump supported on a pillow covered with oilcloth, and having merely a handkerchief laid over it. After an hour or two, the edges of the skin should be approximated with a few strips of plaster—the isinglass the best. The edges are to be brought together in a straight line,

which may be either perpendicular or horizontal, either plan having some advantages. The arterial ligatures should be left hanging out in the insterstices of the adhesive straps. No other application will be needed save a cloth dipped in cold water. Pain may be allayed by an opiate. The stump may remain as it is for some days, the discharge being merely wiped occasionally from its surface. But, after from four to six days, sooner or later, according to the quantity of the discharge and the feelings of the patient, the dressings should be changed, the straps being taken off and replaced one by one, with care not to disturb the ligatures, and the hands of an assistant being employed to support the edges, and prevent their falling asunder. At the subsequent dressings, the points to be attended to are, to renew the light bandage occasionally, which was passed round the stump soon after the operation, in order to support the muscles, and prevent their retraction—to bring together the edges of the wound with adhesive straps—to remove the ligatures when loose—(that on the femoral artery should not be disturbed for a fortnight)—and to accelerate cicatrisation by the nitrate of silver, or other stimulants, if the granulations appear languid.

There are a few varieties in the manner of performing this circular operation that require a brief notice. Some surgeons, after having cut through the skin, dissect it from the fascia, and turn it back—a proceeding necessary enough if this operation is performed (which it never should be) when the cellular tissue is condensed and adherent. Again, if the patient is *very emaciated*, the circular incision may be carried down to the bone at once without ceremony, because in such patients the muscles always retract greatly. Sir C. Bell recommends the skin not to be divided quite circularly, but the knife to be inclined a little, first to one side, then to the other, so as to make two oval flaps. The same may be done also in dividing the muscles. He further recommends that the limb should be raised perpendicularly whilst the bone is being sawn, so that the saw may be worked horizontally, by which means, he says, the bone may be divided more evenly, and much shorter, so that its end will be no more seen when the stump is depressed.

(2.) *Flap Operation.*—The surgeon, standing as before, grasps the flesh on the anterior surface of the limb with his left hand, and lifts it from the bone; then passes his knife horizontally through it—(entering it on the right side behind the saphena vein)—carries the point over the bone, and pushes it through the other side of the limb, as low as possible;—then brings it out upwards and forwards, so as to make the anterior flap. It is again entered on the inner side a little below the top of the first incision, passed behind the bone, brought out at the wound on the outside, and directed so as to make a posterior flap in the direction of the dotted line, a very little longer than the anterior. Both flaps are now drawn back; the knife is swept round the bone to divide any remaining



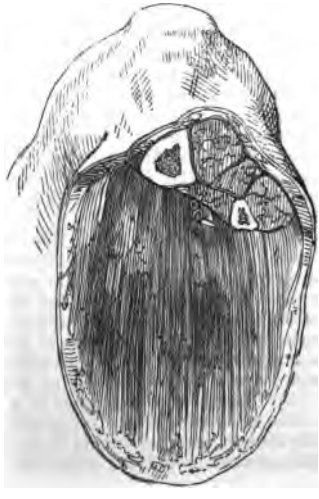
muscular fibres, and the bone is sawn through. In the same manner flaps may be made from the inner and outer sides of the limb, the surgeon first grasping the flesh, and transfixing it, and cutting a flap on one side of the bone, then passing the knife close to the bone on the other side, (without again piercing the skin,) and making another flap.

II. AMPUTATION AT THE HIP-JOINT is performed by Mr. Liston after precisely the same manner in which he amputate the thigh. The femoral artery being compressed, the knife is carried across the front of the articulation, so as to form the anterior flap. Then the anterior part of the capsular ligament being cut into, and the *ligamentum teres* and posterior part of the capsular ligament being divided, the blade of the knife is put behind the neck and trochanters of the femur, and the posterior flap is formed. The vessels on the posterior flap are tied first. But this method can hardly be preferable to that of making two lateral flaps;—first, passing the knife completely through the limb on the inner side of the joint, and carrying it forwards and inwards, so as to form a flap of the adductor muscles; then cutting into the joint, and severing the *ligamentum teres*, and the muscles attached to the digital fossa with a short strong curved knife; and lastly, putting in the knife over the trochanter, and cutting downwards and outwards, so as to make the external flap. In this manner Mr. Mayo performed this operation in less than half a minute. He previously tied the femoral artery below Poupart's ligament; but most authorities prefer compressing it during the operation, and tying its cut orifice afterwards.

III. AMPUTATION OF THE LEG, unless the patient can afford an artificial foot, should be performed as near the knee as possible; —a long stump would be most inconvenient for a labouring man with a wooden leg.

(1.) *Circular Method.*—The artery being under command, as in amputations of the thigh, and the leg being placed horizontally, one assistant supporting it below, and another at the knee drawing up the skin, the surgeon (standing on the inner side for the right leg, and *vice versâ*) makes a circular incision through the skin, four inches below the tuberosity of the tibia. The integuments are next to be dissected up for two inches, and turned back, and the muscles are to be divided down to the bone by a second circular incision. Then a long slender double-edged knife, called a catline, is passed between the bones to divide the interosseous ligament and muscles, and both bones are sawn through together, the flesh being protected by a retractor, which should have three tails. The spine of the tibia, if it projects much, may be removed with a fine saw or bone nippers. The anterior and posterior tibial and peronæal arteries, and any others requiring it, being tied, the stump is to be treated as directed after amputation of the thigh. The integuments should be put together, so as to make a perpendicular line of junction.

(2.) But it is agreed on all sides that the flap operation is by



far the best for this situation. The surgeon passes his knife horizontally behind both bones at the level of an inch below the head of the fibula, and cuts downwards and forwards, so as to make a flap of the posterior muscles about four or five inches long. A semilunar incision, with the convexity downwards, is then made across the front of the limb, the skin is slightly turned back, the parts between the bones are divided, and the bones are sawn as before. The edges are of course brought together horizontally. Mr. Liston directs this operation to be performed as follows. The knife is entered behind the fibula on the right side, and behind the inner margin of the tibia on the left, and is made to cut straight up towards the knee for one or two inches. It is next brought across the front of the limb, so as to make a semilunar division of the integument, and then, being brought to a point opposite the first incision, is made to transfix the limb, and form the posterior flap as before. When transfixing the right limb, the surgeon must take especial care not to get his knife between the two bones. In thus operating high, the poplitæal artery will be divided instead of the two tibials. The relative situation of this vessel, and the form of the flap, are shown in the accompanying figure. The tibia, however, should never be sawn higher than its tuberosity, or the joint will be laid open. The amputation near the ankle is performed in the same manner. If low down, the *tendo Achillis* will require to be shortened after the flap is made.

IV. AMPUTATION OF THE ARM.—In amputation of the upper extremity, the flow of blood may be sufficiently commanded by compressing the artery above the clavicle, or in the arm. If it is thought proper, however, the tourniquet may be applied so as to compress the artery against the humerus.

(1.) *Circular.*—The arm being held out, and an assistant drawing up the skin, one circular incision is made through the skin, which being forcibly retracted, another is made down to the bone. These incisions should be made with two slight divergences, so as to cut the skin and muscles rather longer in front and behind than at the sides. The subsequent steps are precisely similar to those in amputating the thigh.

(2.) *Flaps.*—The knife is entered at one side, carried down to the bone, turned over it, brought out at a point opposite, (the vessels being left behind for the second flap,) and then made to cut a neat rounded anterior flap. It is next carried behind the bone, to make a posterior one of equal length; and is lastly swept round the bone, to divide any remaining fibres. The division of the bone, ligature of the arteries, and treatment of the stump, as before.

V. AMPUTATION AT THE SHOULDER may be performed in several manners. (1.) The patient being seated in a chair, and well supported, and the subclavian artery compressed, the surgeon passes a long knife from the anterior margin of the deltoid muscle, an inch below the acromion, across the outside of the joint, and

brings out the point at the posterior margin of the axilla. If the left side is operated on, the point must be entered at the posterior margin of the axilla, and brought out at the anterior margin of the deltoid muscle. Then, by cutting downwards and outwards, the external flap is made. The origins of the biceps and triceps, and insertions of the infra and supra spinatus, are next cut through, and the joint is laid open. Finally, the blade of the knife, being placed on the inner side of the head of the bone, must be made to cut the inner flap.

(2.) The covering for the exposed part of the scapula, which in the preceding operation was obtained from the outer side, may also be obtained from the muscles in front or behind, supposing the deltoid to be implicated in the disease or injury which demands the operation. One elliptical incision may be carried from beneath the middle of the acromion to the posterior border of the axilla, and another to the anterior border. These flaps being dissected up, the head of the bone may be turned out of the socket, and the remaining soft parts divided; or the bone may be sawn through just beneath its neck.

VI. AMPUTATION AT THE ELBOW is performed by passing the knife through the muscles in front of the joint, and cutting upwards and forwards, so as to make a flap of them. Then the operator (who stands on the inner side for the right arm, and *vice versâ*) makes a transverse incision behind the joint, cuts through the external lateral ligament, and enters the joint between the head of the radius and external condyle, divides the internal lateral ligament, and lastly saws through the olecranon.

VII. AMPUTATION OF THE FOREARM should always be performed as near to the wrist as possible.

(1.) *Circular.*—The limb being supported with the thumb uppermost, and an assistant drawing up the skin, a circular incision is made through it down to the fascia. When the skin has again been retracted as much as possible, the muscles are divided by a second circular incision; the interosseous parts and the remaining fibres are cut through with a catline; the flesh is drawn up with a three-tailed retractor, one tail being put between the bones, which are then to be sawn through together, the saw being worked perpendicularly. The radial, ulnar, and two interosseous arteries require ligature.

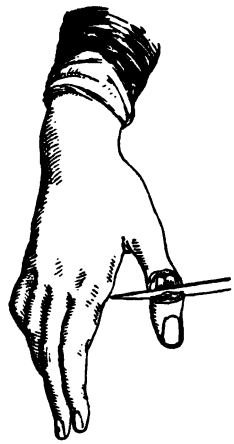
(2.) *Flaps.*—The limb being placed as before, and the skin being drawn back, the surgeon grasps the wrist with his left hand, and forms one flap by cutting obliquely from the skin towards the bones, (through the extensor muscles on the right side, and the flexors on the left). The extremities of this incision should be made to project somewhat on the other side of the limb. The knife is then passed perpendicularly from one extremity of this incision to the other, through the muscles on the other side of the bones, and the other flap is made by cutting through them ob-

liquely outwards; the interosseous parts are then divided, and the bones sawn as before.

VIII. AMPUTATION OF THE WRIST.—(1.) *Circular.*—The skin being pulled back, a circular incision is made a little below the level of the line that separates the forearm from the hand. The external lateral ligament is then cut through, and the knife carried across the joint, to divide the remaining attachments.

(2.) *Flaps.*—A semilunar incision is made across the back of the wrist, its extremities being at the styloid processes, and its centre reaching down as far as the second row of carpal bones. This flap being dissected up, the joint is opened behind, the lateral ligaments are cut through, and the knife, being placed between the carpus and bones of the forearm, is made to cut out a flap from the anterior surface of the palm.

IX. AMPUTATIONS OF THE HAND.—(1.)—Amputation of the fingers or thumb at their last joint may be performed thus. The surgeon holds the phalanx firmly between his finger and thumb, and bends it, so as to give prominence to the head of the middle phalanx. He then makes a straight incision across the head of the middle phalanx, so as to cut into the joint, and takes care to carry it deeply enough at the sides to divide the lateral ligaments. The joint being then held open, and the bistoury placed as in the adjoining figure, it is made to cut out a flap from the palmar sur-

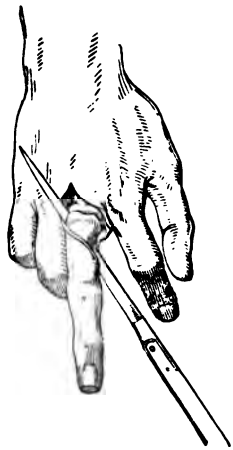


face of the last phalanx, sufficient to cover the head of the bone. Or the surgeon, holding the phalanx firmly, with its palmar surface upwards, may first pass his knife horizontally across the front of the joint, the flat surface towards it, and cut out the anterior flap; then divide the lateral ligaments and the remaining attachments with one sweep of the knife.

(2.) Amputation at the second joint of the fingers or thumb may be performed in the same manner.

(3.) It is always expedient to save as much as possible of the forefinger and thumb; consequently, in cases admitting of it, their phalanges may be sawn across, (or rather cut through with the bone-nippers,) the soft parts having been previously divided by means of two semilunar incisions, and being protected with a piece of split cloth. But this method is necessarily more tedious and painful than amputation at the joints.

(4.) Amputation of a finger at the metacarpal joint may be effected by making a semilunar incision (with the convexity forwards) over one side of the prominence of the knuckle, from a quarter of an inch beyond the joint to the middle of the digital commissure. The finger being then drawn to the other side, the extensor tendon is cut through, and the point of the bistoury is passed into the joint, and made to divide its ligaments. This will allow the head of the bone to be turned out, so that the bistoury



being placed behind it may cut through the remaining attachments, as represented in the figure. This operation may also be performed by making an oval incision on one side of the joint, (as in the last-described method) and then bringing it across the palmar surface, and round the other side, to terminate where it began. The tendons and ligaments are now to be divided, and the head of the bone turned out. The digital arteries must be tied, and after bleeding has ceased, the wound may be closed by confining the adjoining fingers together. It must be recollected that the situation of this joint is full half an inch above the lines that divide the fingers from the palm.

(5.) Amputation of the metacarpal bone of the thumb is performed thus. The part being separated from the fingers, an incision must be carried from the centre of the commissure down to the articulation with the trapezium. It should be inclined rather towards the metacarpal bone. The thumb being then forcibly abducted, the blade of the bistoury is to be carried through the joint, (which, it must be recollected, lies obliquely in a line extending to the root of the little finger;) the head of the bone is to be forcibly dislocated towards the palm; the knife is then made to cut its way out, so as to form a flap of the skin and muscles outside, as far as the first phalanx.

(6.) Amputation of the metacarpal bone of the little finger, at the joint between it and the unciform, is performed thus. The flesh and integuments being grasped, and drawn away from the ulnar side of the bone, a bistoury is passed perpendicularly through them close to the joint, and made to cut its way downwards to a little beyond the articulation with the first phalanx. The skin of the hand being next strongly drawn outward, the bistoury is placed on the other side of the bone, (without again piercing the skin,) and carried along so as to divide everything down to the digital commissure. Then the ligaments of the joint are to be divided, first on the inner, and next on the dorsal aspect. It is, however, a much better plan, if it can be effected, to cut through the bone by means of the saw or bone-nippers, than to remove it at the articulation.

(7.) Amputation of the head of a metacarpal bone is effected by making an incision on each side of it, (as in amputation of the fingers at the joint, but extending higher up,) and then cutting through the bone with the pliers, or, if they are not at hand, with the metacarpal saw. If part or the whole of the shaft of one of these bones is to be removed also, an incision should be made along its dorsum, to the point where the two former ones meet; and then the flesh being dissected away on either side, the bone may be cut through or disarticulated according to circumstances.

X. AMPUTATIONS OF THE FOOT.—(1.) Amputation of the toes at any of their joints is performed in precisely the same manner as amputation of the fingers.

(2.) Amputation of all the toes at their metatarsal joints—an operation which may be requisite in cases of frost-bite—is performed by first making a transverse incision along the dorsal aspect of the metatarsal bones—dividing the tendons and lateral ligaments of each joint in succession; and then, the phalanges being dislocated upwards, the knife is placed beneath their metatarsal extremities, and made to cut out a flap from the skin on the plantar surface, sufficient to cover the heads of the metatarsal bones. The arteries are to be tied and the foot laid on its outer side, so that the discharge may escape more readily.

(3.) Amputation of the metatarsal bone of the great toe is performed precisely like the operation for the removal of the metacarpal bone of the little finger. It is better, if circumstances permit, to cut through the bone, than to disarticulate it from the internal cuneiform bone.

(4.) Amputation of all the metatarsal bones is performed in the following manner. The exact situation of the articulation of the great toe to the inner cunieform bone (to which the tendon of the tibialis anticus may serve as a guide) being ascertained, a semilunar incision, with the convexity forwards, is made from a point just in front of it across the instep to the outside of the tuberosity of the fifth metatarsal bone. The flap of skin so formed being turned back, the bistoury is to be passed round behind the projection of the fifth metatarsal bone, so as to divide the external ligaments which connect it with the cuboid, the dorsal ligaments are next to be cut through, and then the remaining ones, the bone being depressed. The fourth and third metatarsal bones are to be disarticulated in a similar manner, dividing their ligaments with the point of the knife, and taking care not to let the instrument become locked between the bones. The first metatarsal is next to be attacked, and lastly the second, the extremity of which being locked in between the three cuneiform, will be more difficult to dislodge. Perhaps it may be convenient to saw it across. When all the five bones are detached, the surgeon completes the division of their plantar ligaments, and slightly separates the textures which adhere to their under surface with the point of the knife, and then, the foot being placed horizontally, he puts the blade under them, and carries it forwards along their inferior surface, so as to form a flap from the sole of the foot sufficient to cover the denuded bones. The flap should be about two inches long on the inner side, and one on the outer.

(5) Amputation may be performed through the tarsus, so as to remove the navicular and cuboid bones, with all the parts in front of them. In the first place, the articulation of the cuboid with the os calcis, (which lies about midway between the external malleolus and the tuberosity of the fifth metatarsal bone,) and that of the navicular with the astragalus—(which will be found just behind the prominence of the navicular bone in front of the inner

ankle)—must be sought for, and a semilunar incision be made from one to the other, as in the last described operation. The flap of skin being turned back, the internal and dorsal ligaments that connect the navicular to the astragalus, are to be divided with the point of the bistoury—recollecting the convex shape of the head of the latter bone. The ligaments connecting the os-calcis and cuboid are next divided—and, lastly, a flap is to be procured from the sole of the foot, as in the last operation.

STUMPS, *Affections of.*—1. *Secondary hæmorrhage* may occur under the same circumstances as after other wounds, and requires no observations distinct from those made at pages 103 and 243. 2. *Erysipelas* and *phlebitis* have also been fully treated of elsewhere ;—one of them may be suspected to be coming on, if the patient, a few days after amputation, is seized with a violent shivering. 3. It sometimes happens, that the flesh shrinks away from the end of the bone, which becomes white and dry, and finally exfoliates. The nitric acid lotion is the best application. 4. *Protrusion of the bone* is a very awkward circumstance. It not only greatly retards the healing of the stump, but the cicatrix when formed is thin, red, constantly liable to ulcerate, and unable to bear the least pressure or friction. The cause of the *conical stump*, as it is technically called, is generally a want of skin and muscle sufficient to cover the end of the bone. Sometimes, however, it arises from spasmodic retraction of the muscles—especially if they have not been properly supported by bandages during the cure. The remedy is simple ; the bone must be shortened. This may be done in slight cases by making a longitudinal incision over the bone on the side opposite the vessels, and sawing off a sufficient portion of it—removing at the same time any diseased portion of the cicatrix. But if the projection is considerable, a second amputation is necessary. 4. *Neuralgia* of the stump is another very untoward event. It sometimes arises, because the truncated extremities of the nerves (which after amputation always swell and become bulbous) adhere to the cicatrix, so as to be subject to constant compression and tension. Sometimes, however, it is entirely independent of any morbid state of the extremities of the nerves, but arises from some irritation in their course, or from some disease in the spinal cord at their origin. Sometimes, again, no local cause whatever is detectible ; and the pain is evidently connected with an hysterical state of the system. In any case the symptoms are extreme irritability and tenderness—paroxysms of violent neuralgic pain—and spasms and twitchings of the muscles—which not unfrequently retract, and cause the bone to protrude, and the stump to become conical. *Treatment.*—(1) Gentle friction with strong mercurial ointment—to which a little powdered camphor or extract of belladonna may be advantageously added—or Scott's ointment spread on lint, and worn as a plaster—together with change of air, and the administration of remedies calculated to restore the strength,

maintain the secretions, and allay irritability—sometimes suffice to remove the extreme sensitiveness of these as well as of other irregular cicatrices. (2) If the pain and tenderness are referred to one or two nerves only, their bulbous extremities should be cut down upon and removed. (3) If, however, the whole surface of the stump is implicated, or if the bone protrudes, a second amputation should be resorted to. But in the case of young hysterical women, the propriety of a second operation is extremely doubtful. The cases on record in which this practice was adopted, present no very satisfactory results; the pain was removed for a time, but returned when the wound healed. It can therefore be justifiable only when performed at the patient's urgent request, after every local and general remedy likely to be of service has been tried perseveringly, but in vain.

APPENDIX OF FORMULÆ.

F. l. ℞. Acid. Sulph. dil. ♏v—xx ; tinct. opii ♏ii—x ; syr. aurantii f℥i ; infus. cascarill. (*vel* dec. cinchon.) ℥x m. ; pro haustu ter vel quater die sumendus.

2. ℞. Quinæ disulph. gr. ii—v ; tinct. opii ♏v—xv ; sp. camphoræ, sp. ætheris comp. ; sp. ammon. arom. āā ♏xx ; dec. cinchonæ ℥vii—x m. ; fiat haustus 2nda—6ta q. q. hora sumendus.

3. ℞. Quinæ disulph. gr. ii—v ; acid. hydrochloric, ♏x—xx ; sp. camphoræ, sp. æther. nitric. āā ♏xx—xl ; tinct. cardam. c. ℥i, aq. menthæ ℥x ; m. ; fiat haustus 2nda—6ta q. q. hora sumendus.

4. ℞. Sennæ fol. ℥vi, zingib. concis. ℥ß, suc. glycyrrhizæ ℥ii, aquæ ferventis f℥ix ; post horas tres cola et adde sp. ammon. ar. ℥ii ; tinct. sennæ, tinct. card. c. āā f ℥ss ; dosis f℥iss.

5. ℞. Potass. nit. ℈ij, sodæ sesquicarb. ℈ss, vini antimon. ℥ii syr. croci, sp. æther. nitric āā ℥ii, aquæ f ℥vj, m. dosis f ℥iss, 3tiis —5tis horis.

6. ℞. Calomel. gr. i—iii, antim. tart. gr. ⅛—¼, ext. hyoscyami (*vel* conii) gr. ii—v, m. ; fiat pilula 3tia—6ta, q. q. hora sumenda.

7. ℞. Pil. hydrarg., ext. hyoscyami (*vel* pulv. Doveri) āā gr. ii—v ; pulv. ipecac. gr. i ; m. ; fiant pilulæ ii. omni nocte sumendæ.

8. ℞. Pulv. rhei, potass. sulph. āā gr. x—xx ; dec. aloes c. inf. gentian. c. āā ℥vj ; sp, æther. nit. ℥ss m. fiat haustus.

9. ℞. Sodæ potassio-tartratis ℥iv—viii ; tinct. sennæ ℥ii ; sp. myristicæ ℥ss ; aquæ f ℥iss m. fiat haustus.

10. ℞. Hydrarg. c. creta gr. ii—viii ; pulv. Doveri gr. i—v ; pulv. glycyrrhizæ gr. iii m. fiat pulvis omni nocte sumendus.

11. *Saturnine Lotion.* ℞. Liq. plumbi diacet. ℥iss acid. acetic. dilut., sp. vini rect. āā f ℥ss ; aq. f ℥vii m.

12. *Frigorific Mixture.* ℞. Sodii chloridi, potassæ nitratis, ammoniæ hydrochloratis, partes æquales; aquæ q. s. ad solvendum.

13. *Spirit Lotion.* ℞. Sp. vini rect. f ℥i, aquæ f ℥xv; misce.

14. *Liniment.* ℞. Liq. ammoniæ ℥i—iii; lin. saponis (*vel* camphoræ) f ℥i m.

15. *Zinc Lotion.* ℞. Zinc sulph. ʒss—ʒi; aquæ f℥xvi m.

16. ℞. Ammon. mur. ʒss; acet. destillat. sp. vini rect. āā f℥ss; aquæ f℥xv m. fiat lotio.

17. *Nitric Acid Lotion.* ℞. Acid. nitric ♏xv—xxx, aquæ f ℥viii m.

18. ℞. Ol. terebinth. ol. ricini āā ℥iv—vi; tinct. sennæ ℥i; mucilag. acaciæ et aq. menthæ q. s. ut fiat haustus.

19. ℞. Sp. camphoræ ʒss; potass. nit. ℈ii; sodæ sesquicarb. ʒi, (*vel* potass. bicarb. ℈iv); tinct. hyoscyami, sp. æther. nitric āā ʒi—iii; conf. amygdalæ ℥i, (*vel* sacchari, pulv. acaciæ āā ℥iii); aq. f℥viiss m. sumentur cochl. ii, ampla 2nda—5ta quaque hora.

20. ℞. Copaibæ ℥ii—ʒv; mucilag. q. s. sp. æther. nit. sp. lavend. c. āā ℥iii, aq. f℥v m. dosis ℥i ter die.

21. ℞. Zinc. sulph. gr. v, liq. plumbi ♏xxx, aq. rosæ f℥iv m. fiat *lotio.*

22. ℞. Cupri sulph. gr. vi, liq. plumbi ♏xxx, aq. rosæ f℥iv m. fiat lotio.

23. ℞. Liq. cupri ammoniati (ammonio-sulphatis) ♏xx, aq. rosæ f℥iv m. fiat lotio.

24. *Pearson's Liniment.*—℞. Ol. olivæ f℥iss, ol. terebinth. f ℥ss, acid. sulphuric. fort. f℥iss; misce gradatim.

25. *Scott's Ointment.*—℞. Ung. hydrarg. fort., cerat. saponis āā ℥j, camphoræ pulv. ℥j; misce.

26. *Yeast Poultice,* P. L.—℞. Farinæ ℔ i, cerevisiæ fermenti f℥i; misce, et calorem lenem adhibe donec intumescant.

27. *Iodine Lotion.*—℞. tinct. iodin. comp. (P. L.) ♏xx—lx aq. destillat. f℥viii; misce.

28. ℞. Ferri sulph. ℈j, sodæ (sub) carb. gr. xxv, ammon. sesquicarb. ℈j, vin. aloes f℥ii, sp. myristicæ f℥iii, ac. destill. f℥viiss m. dosis f℥ss ter die.

29. ℞. Decoct. sarsaparillæ comp. f℥iv, acid. nitric. ♏v—xv, tinct. hyoscyami ♏x—xxx m.; fiat haustus ter die sumendus.

30. ℞. Hydrarg. bichlorid. ammon. mur. āā gr. i—ii, aq. destill. q. s. ad solvend.; micæ panis q. s., ut fiant pilulæ xii, quarum sumatur una ter die.

31. ℞. Tinct. guaiaci ammon. tinct. humuli āā f℥ss, decoct. cinchon. f ℥ii m.; fiat haustus ter die sumend.

32. *Eye Snuff.*—℞. Pulv. asari, part iii, pulv. flor. lavand. part ii, misce. *Vel* ℞. Pulv. euphorbii, part i, pulv. amyli, part vii; tere optime.

33. *Mercurial Eye Snuff.*—℞. Hydrargyri subsulph. flav. ʒss, pulv. glycyrrhizæ ʒii; misce optime.

34. *Schmucker's Pills.*—℞. Sagapeni, galbani, saponis āā ℥j, rhei ʒiss, antim. tart. gr. xv, succ. glycyrrhizæ ℥j, dosis gr. xv bis die.

35. *Richter's Pills.*—℞. Ammoniaci, assafæt., saponis, valerianæ, arnicæ āā ʒii. antim. tart. gr. xviii, syr. q. s. dosis gr. xx—xxx ter die.

36. *Collyria.*—℞. Zinc. sulph. gr. ss—iv (*vel* aluminis gr. ss—iv ; *vel* cupri sulph. gr. ¼—ii ; *vel* argent. nitrat. gr. ss—iv ; *vel* zinci acetatis gr. i—vj,) ad aq. rosæ *vel* destill. fʒj ; misce.

37.—℞. Hydrarg. oxymur. gr. j, aq. destillat. fʒviii m. ; fiat collyrium frequenter utend. (*Mackenzie.*)

38. *Tartar Emetic Ointment.*—℞. Antim. tart. ʒj, adipis ℥j ; misce.

39. ℞. Liq. calcis chlorinatæ fʒi—iv, aq. destill. fʒviii ; misce.

40. ℞. Mellis confect. rosæ canin. āā ℥j, aceti destillat. fʒss, acid. hydrochlori fʒss. aq. rosæ fʒi, mist. camph. fʒvj, m. ; fiat gargarisma.

41. *Iodine Mixture.*—℞. Tinct. iodin. comp., sp. myristicæ āā fʒss—ii, tinct. hyoscyami fʒss—ii, aq. destill. fʒv m., dosis fʒj ter die. (*Vel* addentur tinct. ferri mur. fʒss—ii.)

42. *Aperient Electuaries.*—℞. Potass. supertart. in pulv. ʒss, sulphuris præcip. ʒii—iv, confect. sennæ ʒj ; syr. zingib. (*vel* theriacæ,) q. s. *Vel* ℞. Magnesiæ, potass. supertart. flor. sulphuris, pulv. rhei āā ʒi, pulv. zingib. ʒss. syr. aurant. (*vel* theriacæ) q. s.—*Vel* ℞. Mannæ, conf. sennæ āā ʒj, sulphuris ʒiii, syr. q. s., dosis ʒi—iv, omni nocte hora somni sum.

43. ℞. Pulv. gallæ ʒj, liq. plumbi diacetatis ♏xv, adipis ℥j ; misce.

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